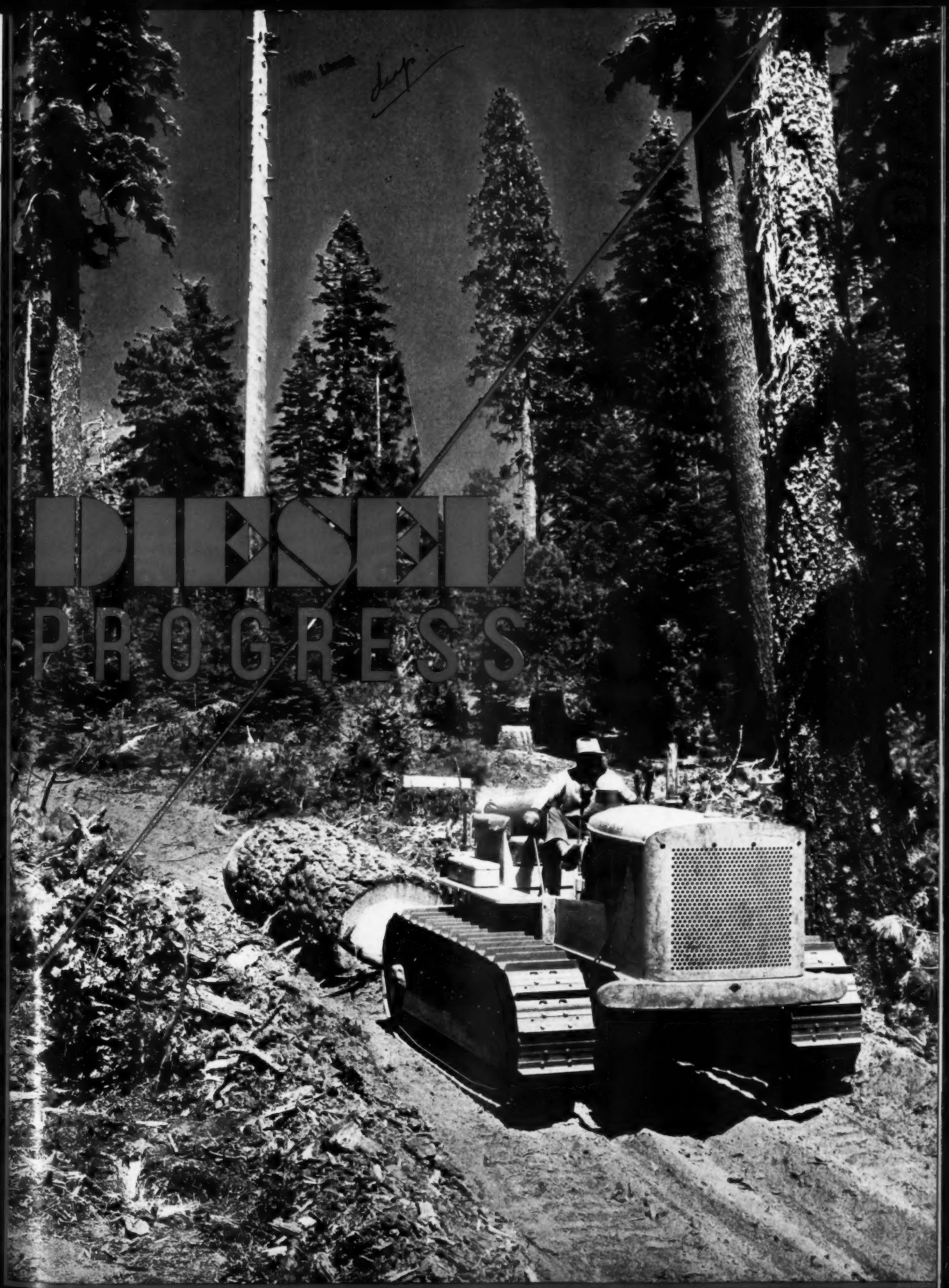

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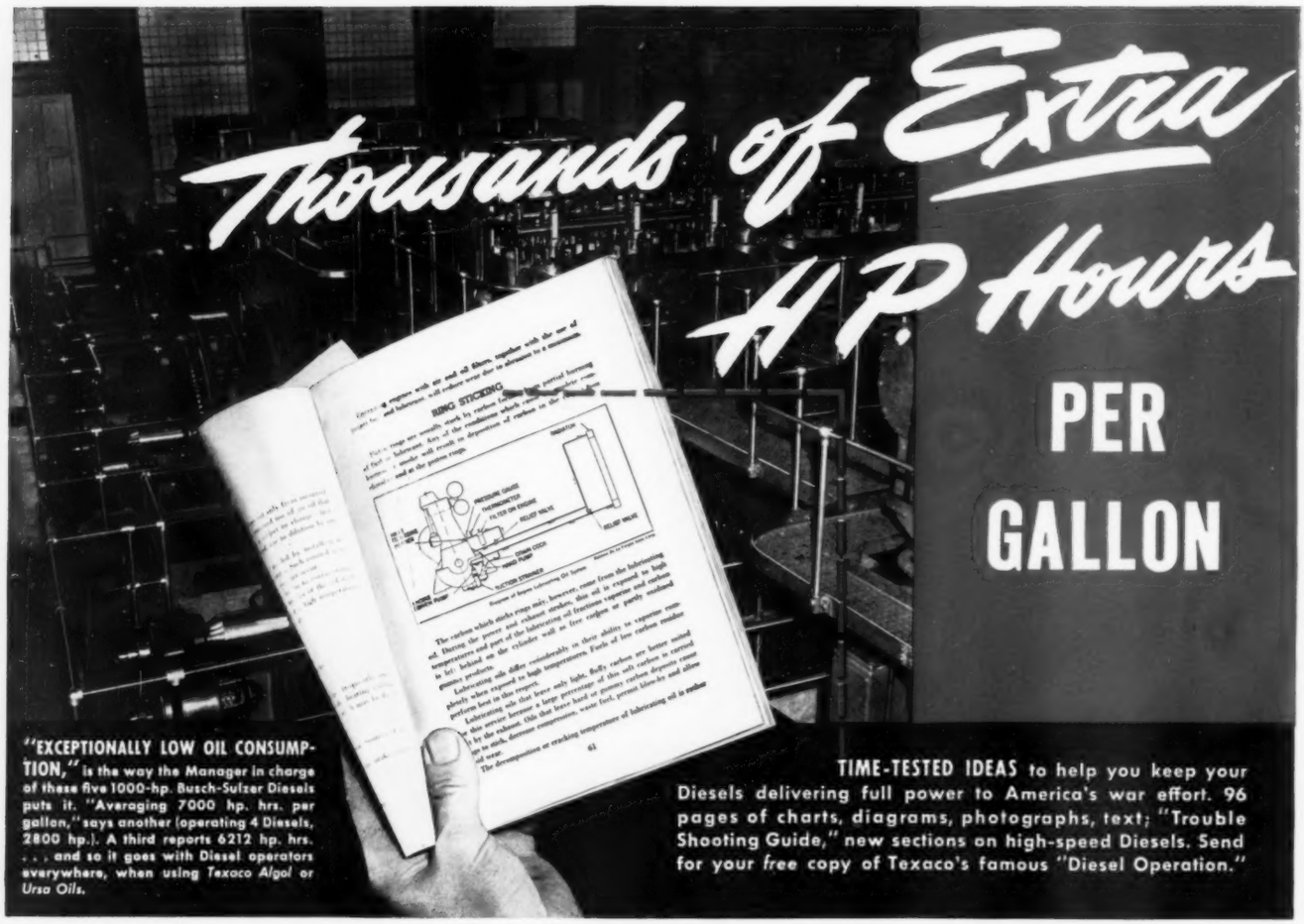

"EXCEPTIONALLY LOW OIL CONSUMPTION," is the way the Manager in charge of these five 1000-hp. Busch-Sulzer Diesels puts it. "Averaging 7000 hp. hrs. per gallon," says another (operating 4 Diesels, 2800 hp.). A third reports 6212 hp. hrs. . . . and so it goes with Diesel operators everywhere, when using *Texaco Algol* or *Ursa Oils*.

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DIESEL PROGRESS, for October, 1942. Volume VIII, Number 10. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized March 27, 1940. Subscription rates: $5.00 per year, single copy, 50c.

REX W. WADMAN
Editor and Publisher

FRONT COVER ILLUSTRATION: A Caterpillar tractor dragging logs at Camp 14 of the Michigan California Lumber Company, thirty miles from Placerville, California. The haul is a little over ¼ mile and the tractor handles about 40,000 feet of timber in an eight hour day.

TABLE OF CONTENTS ILLUSTRATION: Chicago's modern Diesel fireboat, the *Fred A. Busse*, powered with three Cummins Diesels of 250 hp. each and a Cummins Diesel auxiliary unit. The *Busse* can throw 10,000 gpm. as high as twenty-four stories and her streams can batter down a masonry wall in fifteen minutes.

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HEYWORTH CAMPBELL
Art Director

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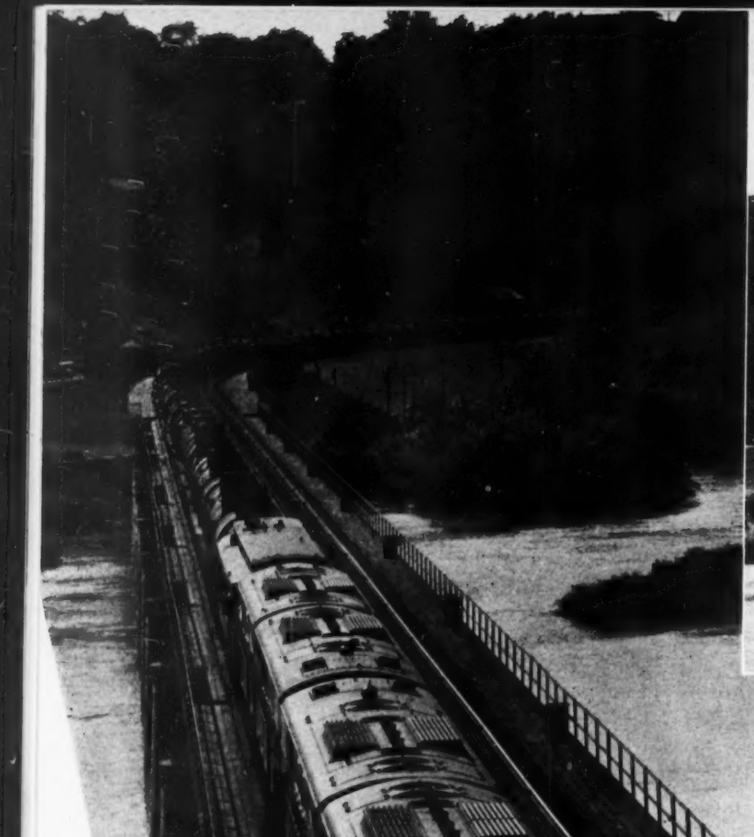
DIESEL and GAS ENGINE PROGRESS



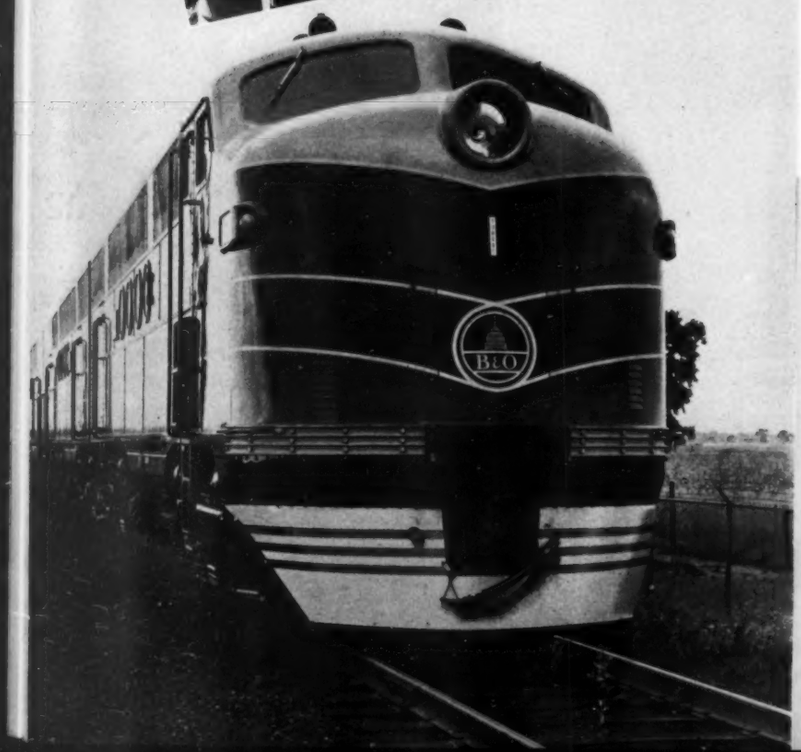
FIRST EASTER AIN
DIESEL FREIGHT CON

By GEORGE D. CROSSLEY

WITH the dispatch of a solid train of tank cars from Chicago, recently, one of the heaviest single through rail shipments of oil on record started moving over the Baltimore and Ohio Railroad to a distribution depot at Twin Oaks, Pa., near Philadelphia.

Heading the train of 5300 gross tons was one of the 5400 hp. Diesel freight locomotives built by Electro-Motive Corporation, subsidiary of General Motors, for the B & O. Never before had a Diesel road freight locomotive been operated in regular service on any railroad in the East.

The schedule called for the movement of the solid train from Chicago to destination without change of locomotive or cars. Five stops were made for the customary crew changes and inspections, but it was necessary to refuel the locomotive at only two of these points on the entire run of 911 miles. Short test runs of the locomotive on heavy tonnage trains indicated that on this longer run it would haul about 175 times the volume of oil that it burns in its Diesel engines.



Top center and top left: Views of the new B & O Diesel freight locomotive on its maiden run and 81 tank car train at Harpers Ferry, W. Va. Note dynamometer car just behind the four power units. Left: View of the 5400 hp. General Motors Diesel freight locomotive.

ER AINLINE
GE COMOTIVE

In order to obtain as accurate data as possible on this unique operation, B & O engineers checked from a dynamometer car placed next to the locomotive.

The new B & O mainline Diesel freight locomotives, like the mainline Diesel passenger locomotives on crack B & O trains, were manufactured by the Electro-Motive Division of General Motors, at LaGrange, Ill. Builder of mainline Diesel passenger locomotives and Diesel switching locomotives now in service on American railroads, Electro-Motive now supplies Diesel mainline freight locomotives. Shortly after Hitler marched on Poland in 1939, Electro-Motive completed tests of an experimental freight locomotive over 83,000 miles of track on twenty-one different railroad lines, under all conditions, with a spectacular record of not a minute of lost time.

The Diesel freight locomotive measures 193 feet from its streamlined prow to its rear coupler. There are four short power cars, each containing a 16 cylinder, General Motors, two cycle Diesel engine, conservatively rated at 1350 hp. The crankshafts of each of these four Diesels, with a total horsepower of 5400, are connected directly to four electric generators, which feed power into the traction motors located in the trucks. There are sixteen traction motors, each of which is geared to two wheels, making every one of the thirty-two wheels of the locomotive a "power wheel."

The locomotive can pull a freight train at 70 miles an hour, as compared with a maximum speed of 120 miles an hour for her sister mainline passenger locomotive, but in actual freight train operation such speed is not required or attained on the road.

Frequent water stops are unnecessary, because water is used only in the radiators of the four powerful internal combustion engines that can go days without replenishing, like automobile engines. Fuel oil tank capacity is 4800 gallons.

Even more important than these time-saving Diesel qualities is the accelerating ability of the new freight locomotive. Design of the electric transmission and flexibility of the two-cycle Diesel engines enables the locomotive to start a long heavy train—either on the level or on an upgrade—and get it up to balanced speed in less time and distance than are required by the most powerful steam locomotive to do the same job.

Time saved through quick acceleration after stops or slowdowns for curves or other road conditions mounts into hours over long distances. The Diesel freight locomotive has the same tremendous power available at low speed as at cruising speed. Moreover, the power is electrically and evenly applied at thirty-two power wheels which gives greater traction in wet weather.

Operation of the Diesel locomotive is less affected than the steam locomotive by weather—extreme cold or heat. For inspection and repairs, two men can handle every moving part of the GM Diesel engine, except the crankshaft, without a crane. The B & O has tested the high availability of Diesel mainline passenger locomotives, which normally receive a general shopping about every 750,000 miles, as compared with 150,000 miles for a steam locomotive. One B & O Diesel passenger locomotive ran over a million miles before major overhaul.

A novel feature of the new locomotive is its ability to brake electrically. Electrical retarding brakes have been used on some of the older types of electric locomotives, which draw their current from power lines through trolleys or third rails, but it is a new feature on "independent" Diesel freight locomotive power. By simply reversing the fields of the Diesel locomotive's sixteen traction motors, they became generators. This method of producing retardation is similar to that of driving an automobile downhill in second gear. The electric current, so generated, is fed into grids on the roof of the locomotive power units and is dissipated in the form of heat. This new method of braking, made possible by the flexibility of the electrical transmission of a Diesel locomotive, saves wear and tear on brake shoes and wheels of the whole train.

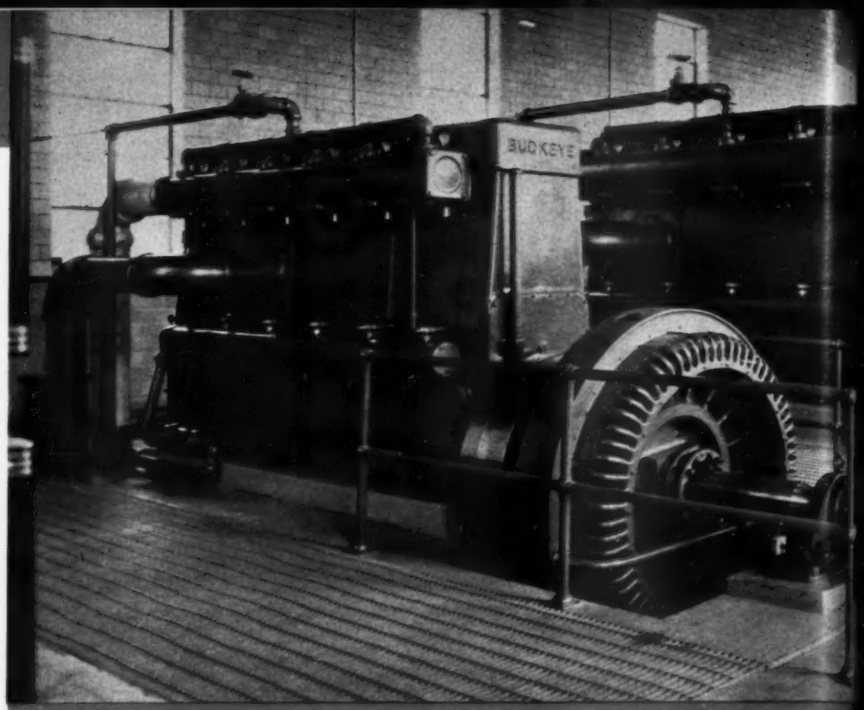
The operating crew's compartment is similar to that of the Diesel passenger locomotives. All control levers are easily accessible, and, with the exception of one lever that controls the traction motor connections, they are identical to steam locomotive controls—namely, throttle, reverse bar, train and locomotive air brakes, sander, bell valve and whistle cords. It is simple, therefore, for an engineer to switch over from steam to Diesel after a few hours of instruction.

An instrument board, similar to an automobile dashboard, has indicators which show track speed, air brake pressures, wheel slip and train control indications. Back in the engine rooms are indicators to signal Diesel engine trouble and hot journal bearings. Automatic windshield wipers and defroster slot are provided.

Adequate ventilation in the cab is provided by roll-down side windows, and can be heated for cold weather by merely throwing a switch. Rear wall and roof of the cab are soundproofed against train and engine noises, enabling the crew to carry on conversation without raising their voices above a natural pitch.

The power-car framing is constructed on the trussed bridge principle. The streamlined prow of the locomotive is specially braced with a battleship battering ram to protect the crew in case of a collision. The crew's safety is further provided for by the position of the cab high in the nose, above and back of the normal point of impact.

The appearance of the new B & O Diesel freight locomotive is similar to that of its sister passenger locomotives, with the notable exception that its nose is more blunt, suggesting bulldog power. Since there is no smoke, soot and steam to mar the finish, the designers used the same colorful paint job used on Diesel passenger locomotives, airplanes and modern trucks.



Above and right are seen the three Buckeye Diesels totalling 975 hp. and G.E. generat... in the Grayling, Michigan, municipal plant.

DIESELS REDUCE

UNDOUBTEDLY, there are many people who would not consider Grayling, Michigan, a vacation paradise. After all, there are individuals who would find no thrill in fishing the Au Sable River, world famous trout stream. There are pavement-bred feet that would find no pleasure on the forest trails hunting deer or the game birds of the North Woods. There are steam heated souls that would shiver at the thought of the crisp snow on the ski slopes and toboggan runs. But, fortunately for Grayling, there are enough outdoor sports enthusiasts to make this North Michigan town a prosperous, year-round playground. Curiously enough, the same vacationer who thrives on the ruggedness of nature demands all the comforts and conveniences of modern civilization when he is back in town. To supply the requisite luxuries for the paying guests as well as the normal comforts of life for the permanent resident, Grayling needs power, the unfaltering brand of power that is always ready to serve at the flick of a switch. Grayling has had this power since March, 1940, through the medium of a three-engine, 975 hp. Buckeye Diesel power plant.

Before installation of the Diesels, this community of 2,100 population depended for electric power on the vagaries of an eighty mile transmission line traversing wild country. Service was poor and rates were high. A special election in February, 1939, found 70 percent of the voters in favor of constructing a municipal plant and a bond issue of $154,000 was voted to acquire generating facilities and a distribution system. Of this sum, only $34,000 obligated general revenues, the rest being a lien on plant earnings. In just two years, the city's plant has accomplished these things: net operating profit is more than 30 percent of gross income; rates to the consumer have been cut 20 percent; the city tax rate has been reduced 2 mills; and, most important of all, the plant has given two full years of service without a single interruption of power.

This is still a new plant but already the record shows a substantial increase in load with attendant economies. In the first operating year, plant production was barely a million kilowatt hours. In the second operating year, ending April 16, 1942, production was 1,360,300 kw.hrs. For this most recent period, the operating costs were as follows:

Fuel	$6,266.04
Lubricating Oil	497.91
Labor	4,330.00
Maintenance & Repairs	106.54
Total	$11,200.49

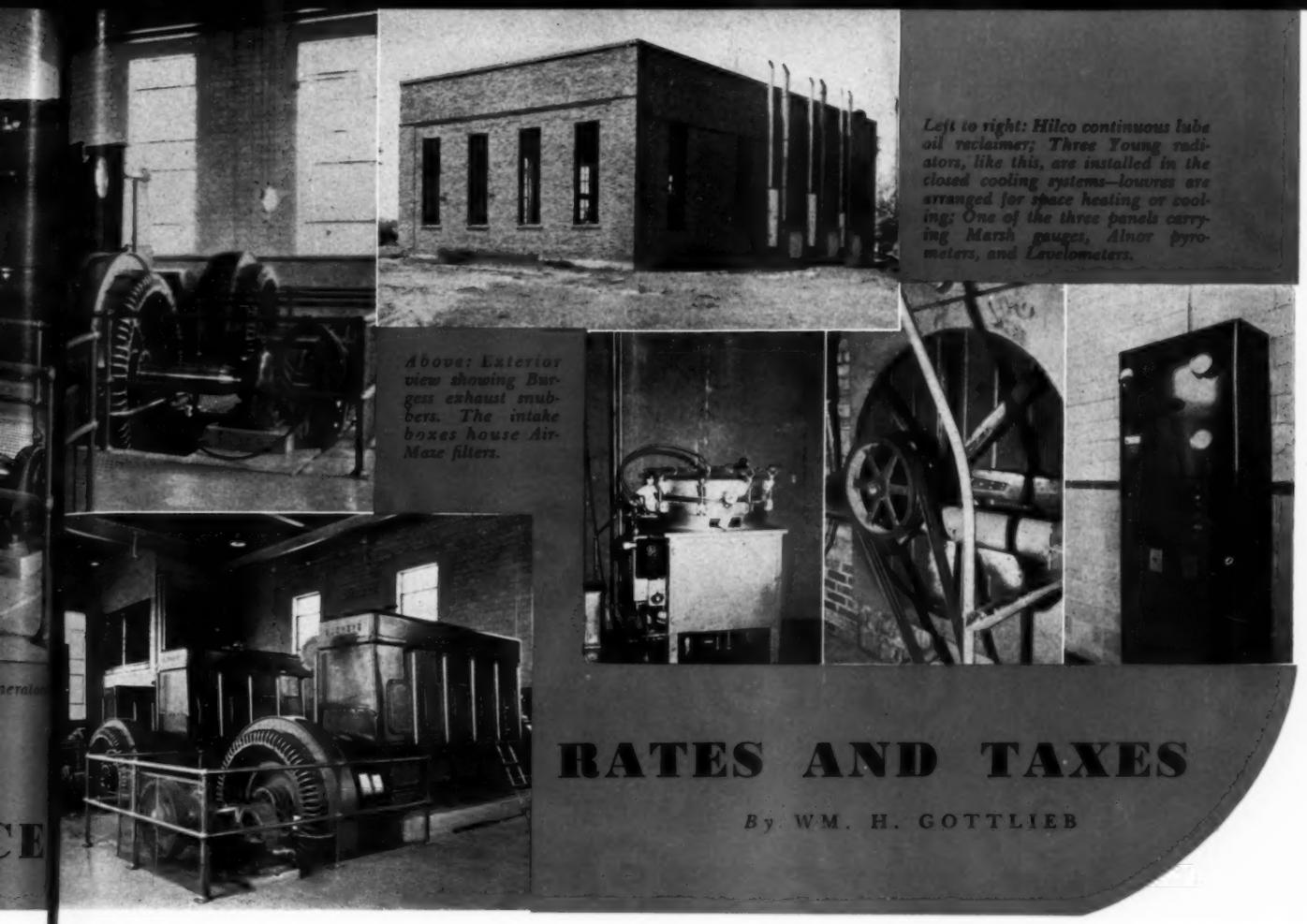
This represents an operating cost of 8.24 mills per kilowatt hour at the switchboard. Adding insurance, depreciation on equipment and building depreciation we get:

Total Operating Cost	$11,200.49
Insurance	900.00
Depreciation equip. at 5%	3,340.00
Depreciation Building	346.00
Total	$15,786.49

The cost per kilowatt hour with full depreciation was 11.6 mills. The continuing rise in volume of production will slash the unit cost of overhead and should soon bring the grand total down to 9 mills.

There are no magician's tricks to account for the immediate success of this plant. It was designed to meet anticipated load conditions and it is operated according to intelligent plan. The inevitable result of good equipment properly operated at good load factor is economy. The entire plant used only three gallons of lubricating oil a day. That is the kind of performance translated easily into dollar economy. Grayling has a well balanced load, half residential and half commercial though the war effort has penetrated the North Woods with a little industrial demand. Varied vacation activities in every season of the year provides an even load which ranges between a low of 100 kw. and a high of 420 kw. during the average day.

To carry this load, Grayling, assisted by Ayres, Lewis, Norris and May of Ann Arbor, Michigan, consulting engineers, chose three 4 cycle, mechanical injection, Buckeye Diesels, two 5 cylinder units of 13½ in. bore and 15½ in. stroke, rated 375 hp. at 360 rpm. and one 6 cylinder, 9½ in. x 14 in. engine rated 225 hp. at 400 rpm. Each of the larger units drives directly a 250 kw., 4800 volt, G.E. generator with 7½ kw. belted exciter, while the smaller unit is direct-connected to a 150 kw. G.E. generator with 5 kw. belted exciter. The balance of engine sizes permits operation at good load factor throughout the twenty-four hour period. Load expansion is eating into the plant's reserve capacity and Grayling is glad to have heavy duty engines designed for long service and protected against every foreseeable trouble. A closed cooling system employing a Young radiator for each engine permits only soft water to reach the engine jackets. Water is circulated



Left to right: Hilco continuous lube oil reclaimer; Three Young radiators, like this, are installed in the closed cooling systems—louvres are arranged for space heating or cooling; One of the three panels carrying Marsh gauges, Alnor pyrometers, and Levelometers.

Above: Exterior view showing Burgess exhaust snubbers. The intake boxes house Air-Maze filters.

RATES AND TAXES

By WM. H. GOTTLIEB

through this system by three 150 gpm. Weinman centrifugal pumps driven by 3 hp. motors. The radiators are arranged so that an adjustment of louvres can either direct warm air into the building for winter heating or send hot air out for summer cooling. Makeup water is drawn from a well and treated in a Permutit softener.

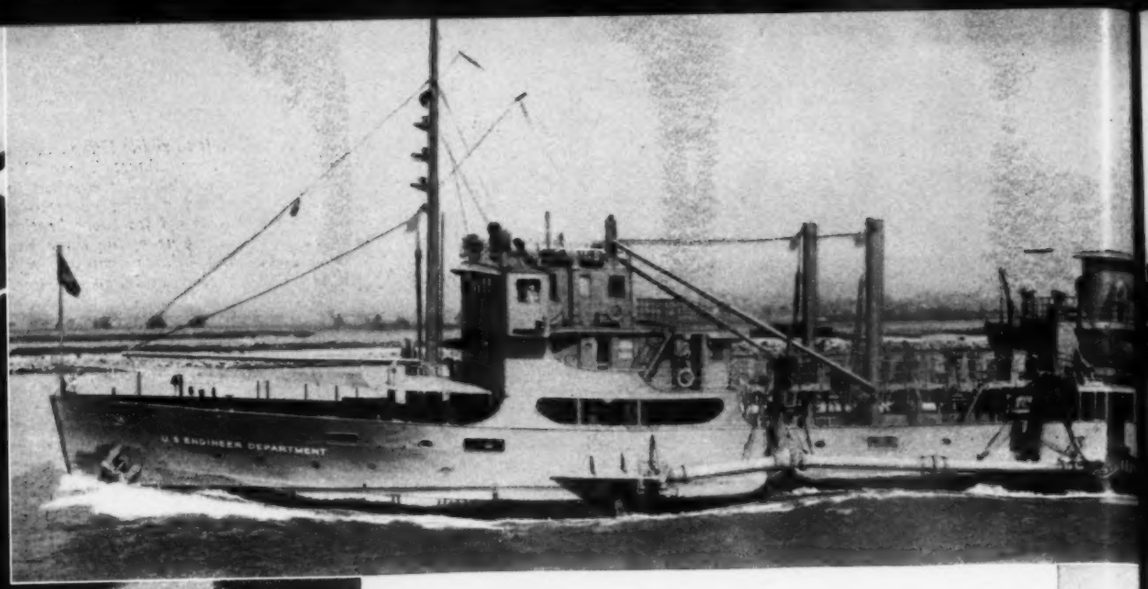
Every essential part of each engine is supplied with lubricating oil under pressure by a built-in engine-driven pump. A shell-and-tube oil cooler is included in each lube circuit. To keep the oil in condition, the engineers have provided a Hilco activated clay purifier which is kept in service continuously. The purifier can take oil from any one of the three engine sump tanks, returning the lube to the tank after purification. Standard Oil's Nonpareil is used throughout the plant with satisfactory results. Oil consumption has been low, wear slight, and stuck rings non-existent.

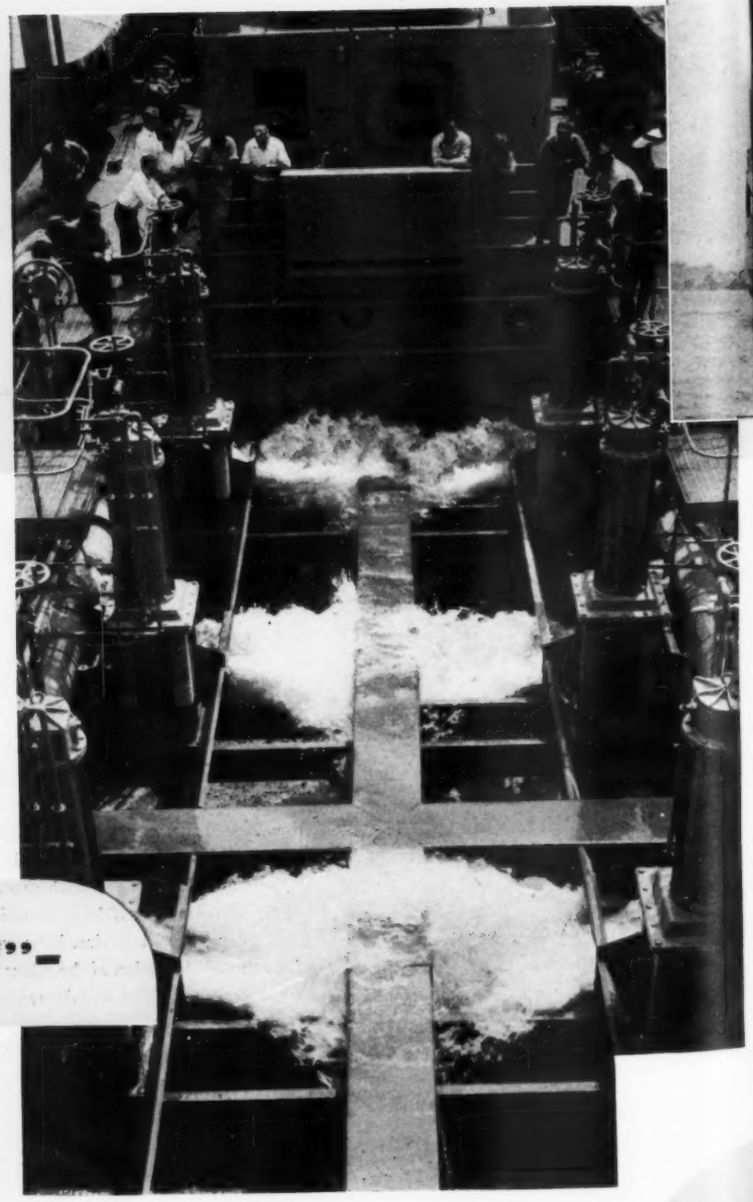
The fuel (Leonard Refining Co. No. 3) is unloaded from trucks into two 10,000 gallon tanks above ground near the plant. The fuel flows by gravity to the three 300 gallon day tanks in the plant basement from which the engine pumps draw their supply. There is a Buffalo screen filter and meter between each day tank and engine. Fuel injection is regulated closely to meet load conditions by Woodward relay-type governors. Intake air is cleaned by an Air-Maze impingement-type filter for each engine. Exhaust gases pass through vertical Burgess snubbers at the rear of the plant.

For convenience in operating, there is a compact panel on the wall at the control end of each engine. Each board has an Alnor pyrometer, a Levelometer for the day tank, Marsh pressure gauges, alarms on lube pressure, cooling water temperature, low fuel level in the engine supply tank and high level in the day tank. The motors that drive the radiator fans and cooling water pumps can be controlled from these boards. In addition to this complete alarm system, each engine has a device known as the Silent Watchman which shuts down the engine automatically if lube or water pressure fails. There is sufficient time between the sound of alarm and the action of the Silent Watchman to permit the operator to take remedial action.

The engines are equipped with U. S. Gauge thermometers. The Curtis starting air compressor, V-belted to a 3 hp. motor, automatically keeps five air bottles at 220 lbs. A Furnas Electric Co. pressure control starts the motor when pressure in the tanks drops. The same compressor also can be driven by a 3 hp. gasoline engine. The five panel Ideal Electric Co. switchboard is equipped with General Electric instruments and switches including totalizing kilowatt-hour meters, cycle meter, synchroscope, and three voltage regulators.

The plant is operated by Superintendent Jess Sales and two operators. The two linemen also are qualified as operators and can be used for relief. All maintenance work is done by this staff. The entire power system and other municipal utilities are supervised by City Manager George A. Granger with the cooperation of Mayor George Burke and the members of the city council. Grayling was optimistic about its Diesel plant and results have exceeded expectations. The city invested in Diesels to improve service and reduce rates and taxes a little. With just a little more than two years gone by, the plant can point to a 20 percent rate cut, a 2 mill tax reduction, and nearly 25,000 engine hours without an enforced shutdown. But there is no cause for surprise—that's the kind of service you expect in paradise.

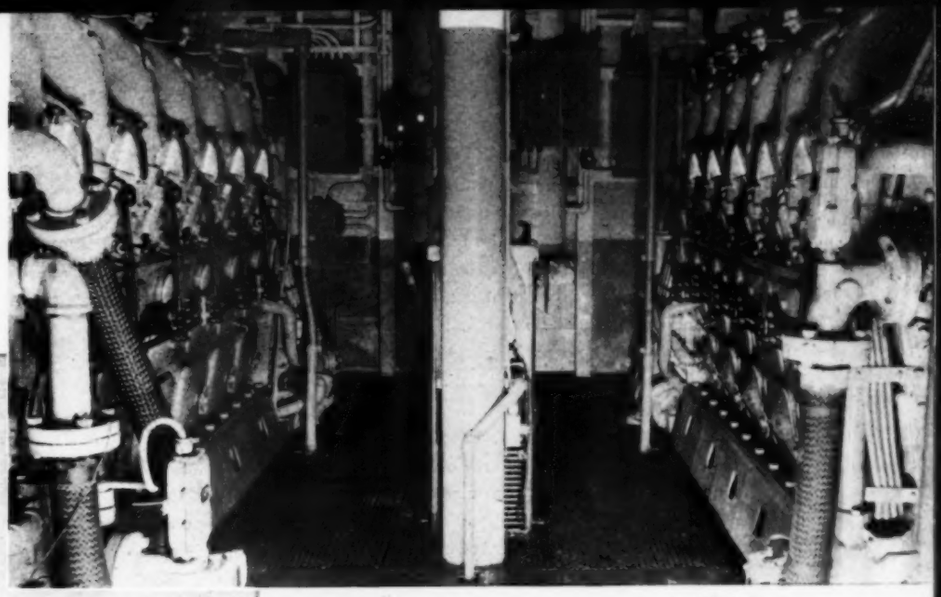


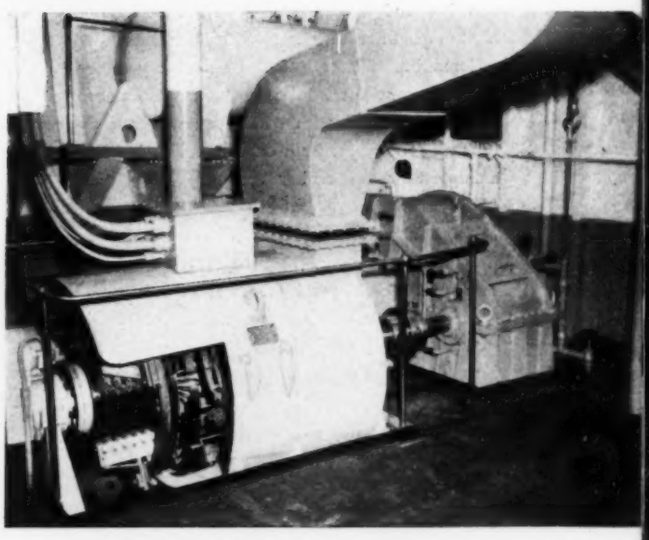


"HAINS" AND "HOFFMAN"—

Top view: The "Hains," fast seagoing Diesel-electric hopper dredge on trial run in the Delaware River. Left: Builder's plate and U. S. Engineer Department emblem on the "Hains." Above: Loading the hoppers.

Right: Looking forward in the main engine room, the two General Motors, 2-cycle main Diesels. Lower right: One of the Westinghouse propulsion motors and reduction gears.





SEAGOING HOPPER DREDGES

By WILBUR W. YOUNG

WHEN the U. S. Engineer Department goes out for highly specialized dredges for river and harbor maintenance, they know what they want and they get it. The two sister ships, *Hains* and *Hoffman*, interesting and unique vessels for shoal water dredging, are the most recent and excellent examples of the Department's complete mastery of such problems.

These Diesel-electric, twin-screw, fast seagoing hopper dredges were built by Pusey and Jones Corporation to basic designs, developed by and under the personal supervision of Colonel Harry B. Vaughan, Jr., District Engineer of the Philadelphia United States Engineer District.

The basic power units of these ships are two General Motors Diesels of 950 hp. each at 750 rpm. direct connected to 565 kw., 600 v., D.C., Westinghouse generators in each vessel. This machinery is well arranged in the sound insulated engine room. One generating unit is used entirely for ship propulsion at 565 kw., 600 v. and the generator is arranged for separate excitation at 240 v. The second Diesel generator set is used for driving the dredge pump motor at 310 kw. The main Diesels are the product of Cleveland Diesel Division of General Motors and are the familiar 12-cylinder, two cycle, Vee type, uniflow scavenging engines, with built-in scavenging blowers.

Aft of the engine room in a water tight compartment are located the propulsion motors, each 700 bhp., which turn the propellers up to 190 rpm. through single Westinghouse reduction gears. These motors are controlled electrically from either the wheel house or engine room. Variable field control of both main generators permits vernier propeller and dredge pump motor speeds, as well as of the two 230 v., 40 hp. drag pipe winch motors. The last mentioned motors derive their current from a specially adapted motor-generator set comprised of a 75 hp. motor direct connected to two 35 kw. generators. The entire propulsion, pumping, and drag pipe power control thus permits fine coordination of these three operations which results in an optimum dredging cycle.

Two ingenious devices were worked out by the builders to enhance dredging operations; one a dial, 4 ft. in diameter, placed within full vision of the drag tenders to indicate continu-

ously the vessel's draft or the distance between the drag head and the surface of the water; the other is an indicator placed on the after drag davits showing at all times the position of the drag head outboard or inboard of the vessel's hull allowing for list. The latter is a safety measure to help avoidance of breakage of the drag pipe through impact with the hull.

Going back to the engine room for a moment, we find two auxiliary generating sets; one a 60 kw. General Motors Diesel with direct connected Westinghouse generator; the other a 10 kw. emergency set of the same makes of units.

A Sharples centrifuge is installed for fuel oil cleaning and a Youngstown Miller activated earth type filter unit is provided for lube oil reclamation. Elliott twin strainers are also fitted for continuous lube filtration. The main engines are fitted with Alnor pyrometers and lube oil cooling for both engines is handled by a single Ross heat exchanger.

Definite objectives marked the conception of these unusual dredges, limiting draft to a maximum of 12.5 ft. to render them effective in comparatively shallow water and calling for speed sufficient to minimize the time elapsing between actual dredging operations. Both of these main objectives had, of course, to be coordinated with the ship's hopper capacity of 700 cu. yds.

The builder's trials, held on the Delaware River several months ago, clearly showed that the *Hains* and *Hoffman* were destined even to exceed basic expectations. They achieved a loaded speed of 11¼ knots—faster than any of the U. S. Engineer Department's smaller seagoing dredges. Under adverse loading conditions, caused by frequent passing of cargo ships, the single twin-suction dredge pump filled the hoppers in thirty-six minutes working along a shoal canal bank. It is noteworthy that the serviceability of this canal is the result of regular dredging operations carried on by the Engineer Corps. In light condition, the vessels made 13-1/3 knots, a speed which assures a fast return from the dumping grounds—faster than vessels of this type have heretofore achieved.

Overall dimensions of these dredges were determined for easy handling in tidal rivers and confined harbors and canals. They are 215 ft. 11 in. in length overall, 212 ft. between perpendiculars, with molded beam of 40 ft. 4 in., and overall beam of 53 ft.; the draft, light, is 8 ft. 2 in. and, loaded, 12 ft. 6 in. Their capacity is 700 cu. yds. or 975 tons. Total shaft horsepower is 1400.

Entering the hull on either side in line with the pump room, the suction drag pipes connect with the 420 hp. dredge pump which is situated on the ship's centerline below the water plane when the dredge is light. The 20″ riser branches into two 20″ discharge pipes which extend over the eight hoppers. Manually controlled nozzles are fitted to these pipes and hollow steel wires are fitted along the tops of the hopper overflow coamings with means for manual raising and lowering to provide additional hopper capacity when desired.

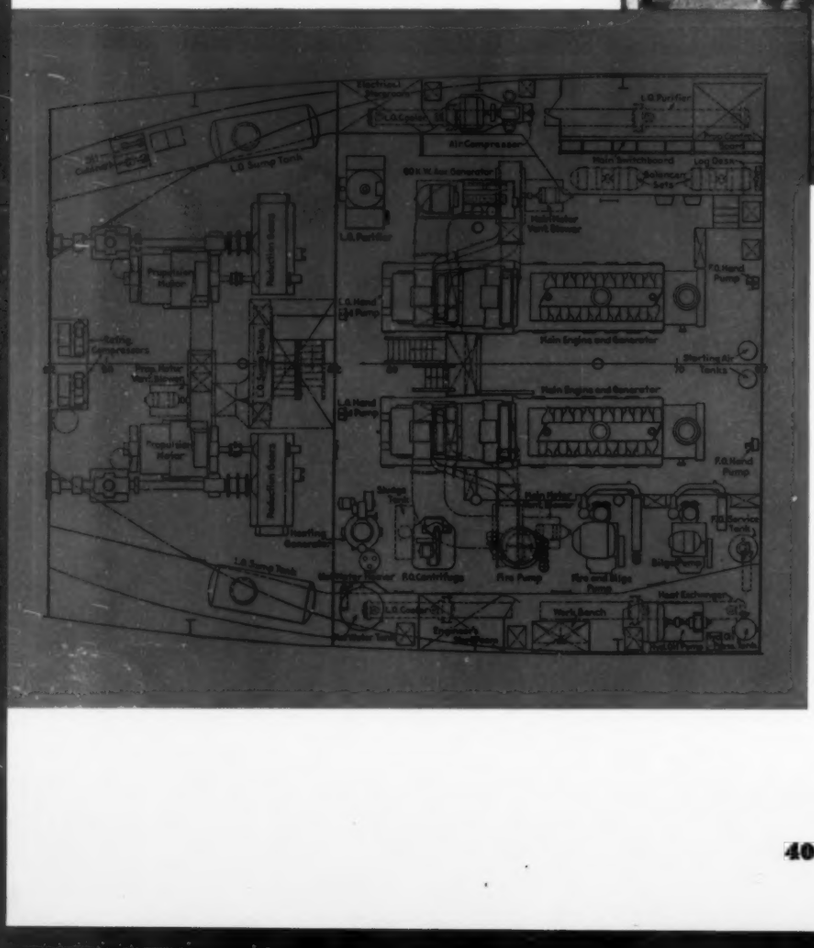
In general arrangement, the *Hains* and *Hoffman* follow modern tanker design with hoppers amidships, officers and deck crew quarters in the forward deckhouse, and engineer quarters, galley and mess facilities aft. While space limitations dictated close arrangement of quarters to accommodate fifty-eight crew members, quarters are notably comfortable.

As noted, the vessels are essentially Diesel-electric not only in propulsion, but in powering of auxiliary machinery. Electric motors and generators, also the electrical equipment are Westinghouse. The ships' construction and outfitting conform with Bureau of Marine Inspection and Navigation requirement and carry the Bureau's Coastwise Certificate. Both vessels will operate in the Delaware River until expiration of the builder's guarantee periods.

It has long been the custom of the U. S. Engineer Department to name its ships for distinguished U. S. Army officers. The *Hoffman* was named for Brigadier General George Mathias Hoffman, who campaigned with the Engineer Corps in the Spanish-American War and won the Distinguished Service Cross for service in France in 1918. He was second man in his class upon graduation from the U. S. Military Academy in 1896. General Hoffman's daughter, Mrs. P. B. Stovin of Montclair, N. J., christened the *Hoffman*.

The *Hains* was named for Major General Peter Conover Hains, who had the unique distinction of having actively served in the Civil War, Spanish-American War, and the first World War. Miss Evans Vaughan, Marion Golf Manor, Ardmore, Pa., daughter of Colonel Harry B. Vaughan, Jr., christened the *Hains*.

View of the navigating bridge looking to port.



Plan showing arrangement of main and auxiliary Diesels and generators, engine room accessories, also propelling motor room, all on lower deck level.

Officer instructor and enlisted men examining valve mechanism of a Gray Marine Diesel engine.

Studying clutch and reverse gear.

Nozzle test pump manipulation.

GRAY MARINE'S U. S. NAVAL SCHOOL FOR DIESEL OPERATORS

Classroom work in the Naval Training School.

Learning how to adjust Diesel valves.

ANOTHER session of the U. S. Naval Training School for Diesel Operators got under way at the Gray Marine Motor Company in Detroit on Monday, August 31. This present class is made up of a number of enlisted men from various branches of the Armed Forces. This school is one of several throughout the country. The first group for session No. 1 started work on July 5. The men are quartered at the Naval Armory located nearby.

Many of the men assigned to this school have had previous training in the operation of Diesel engines, and are selected on the basis of aptitude to do specialized work. They use text materials prepared by the Gray Marine Motor Company, along with a course of study and practice arranged by the Civilian Supervisor. Primary emphasis is placed upon maintenance and servicing of Diesel engines with certain hours each day devoted to the study of engine theory and classroom work.

ANOTHER interesting example of speed and efficiency in meeting war-time demand for skilled Diesel mechanics was recently demonstrated by the Hemphill Institute of Technology, Los Angeles, California.

Ralph Hemphill, owner of the Hemphill Institute, was in Washington a few months ago when he was asked if he could organize a Diesel training school in Los Angeles.

"Certainly," answered Hemphill. "How soon do you want it?" "As soon as possible."

With these instructions, Mr. Hemphill returned to the West Coast and immediately proceeded to follow through with this rather difficult assignment. Time did not permit the designing and construction of new buildings necessary to train and house hundreds of bluejackets.

Following a speedy, but thorough, search for suitable training quarters, Hemphill officials decided to lease the property and buildings formerly occupied by the Harvard Military Academy. According to Mr. Hemphill, these buildings were in a woefully run-down condition. They required complete renovation and remodeling. At first the job appeared discouraging and hopeless.

Nevertheless, the former Academy site presented unusually favorable possibilities. In exactly eight weeks, at a cost of $70,000, all buildings were remodeled, improvements made, equipment installed, administration and instruction staff organized, and school made ready for occupancy and operation.

On August 2, the first group of 150 enlisted men of the United States Navy arrived to "take-over" the buildings and start their intensive course in the study and operation of Diesel Engines, under the experienced direction of Hemphill officials and instructors.

Lieut. J. F. Welsh, recalled to active duty recently, is commanding officer of the school. R. E. White, former director of training and education at the Hemphill School in New York City, occupies similar position in the educational departments.

One of the striking features of this new Hemphill Diesel Training School is its compactness, yet there is a feeling of space and roominess. Such an arrangement contributes to convenience and efficiency. The time consumed in moving men from classrooms to shops is thereby cut to a minimum.

New student arrivals are impressed with the beauty of the landscaped grounds, the shady trees and the vine covered buildings. Incidentally, the school is ideally situated in a centralized locality in Los Angeles, which enables students to visit nearby California places of interest when on brief furloughs.

To this bustling little Diesel educational center come hundreds of youngsters eager to enter the Navy's western production line of mechanical training. It is a line that moves continuously, ever faster, toward the transformation of civilians and enlisted men into Diesel specialists. Here the bluejacket youth who wants to know the mechanics, maintenance, and operation of Diesel Engines is also taught military practice and procedure. He learns how to drill, how to address his superiors and care for his equipment. A military atmosphere is always apparent.

These bluejacket students work hard at their studies. They exercise and battle in vigorous games when they're not sleeping and eating, for their ability and their fitness equips them to pursue successfully their future duties.

And speaking of sleeping and eating, they get plenty of both. So far as eating is concerned, the food is of the very best—and each man can have as much as he wants. Among the best planned buildings in any Navy camp is the Mess Hall. The study given the kitchen and serving counters makes it possible to serve a meal to 150 men in six minutes without hurrying or crowding. Secret of the plan is the centralized location of the kitchen and its adjuncts, and the division of the dining space into two rooms of moderate size.

During the first few days in camp, the chef, who was formerly with the Hotel New Yorker in New York City and the famous Brown Derby restaurant in Hollywood, California, cooked food in "Kingly" style. In fact, it was so deliciously and elaborately prepared—he was instructed to "take off" the "frills" and not be so "ritzy." Even though he complied with the request, the food is still plenty good.

The sleeping quarters, like the sustenance building, are "tops" and living facilities in barracks are palatial compared with World War I. During their eight weeks of intensive training, the men divide their time between class rooms and shop work. White uniforms are worn in classes—blue work clothes in shops. Classrooms are large, pleasant, airy, comfortable, and quiet. The shop interiors leave little to be desired in the way of clear space, good lighting and com-

plete modern equipment. Most every type of Diesel engine is available for student study. In both the Diesel Engine and Pump and Nozzle Shops, students are trained by experienced Hemphill instructors in the repair, service, and maintenance of Diesel engines.

Students are also instructed in valve and bearing serving methods—trouble shooting on basic types and engine rebuild. Thorough training is given in diversified auxiliary equipment such as —pumps, control devices, filters, lubricators, auxiliary engines and reverse gears. Pump and nozzle shop is equipped with special makes of fuel pumps from the engine manufacturers.

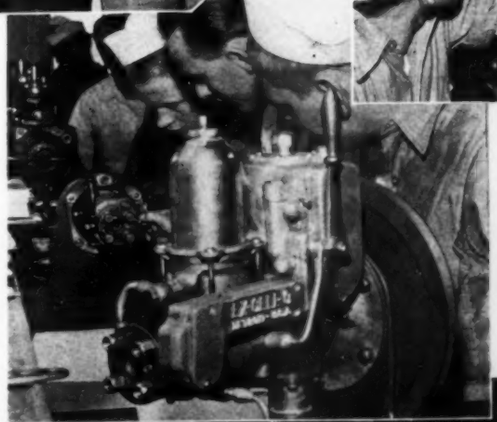
To the mechanical minded layman possibly the two most interesting units on the grounds are these two shop buildings. Here the student studies the Diesel in operation. It's one of the many training routines these hundreds of eager young men go through at this Naval Diesel School as they embark upon their chosen war-time career, leading to Naval activities on embattled seas.

A large Recreation building which serves the entire student body has auditorium, canteen, gymnasium, reading, writing and reception rooms, emergency hospital, post-office, tailor shop, laundry, sleeping quarters and various other rooms for the use of the men. The auditorium, with a comfortable seating capacity for 600 men, successfully meets requirements for small theatrical and motion picture productions. It is also used for meetings and dances.

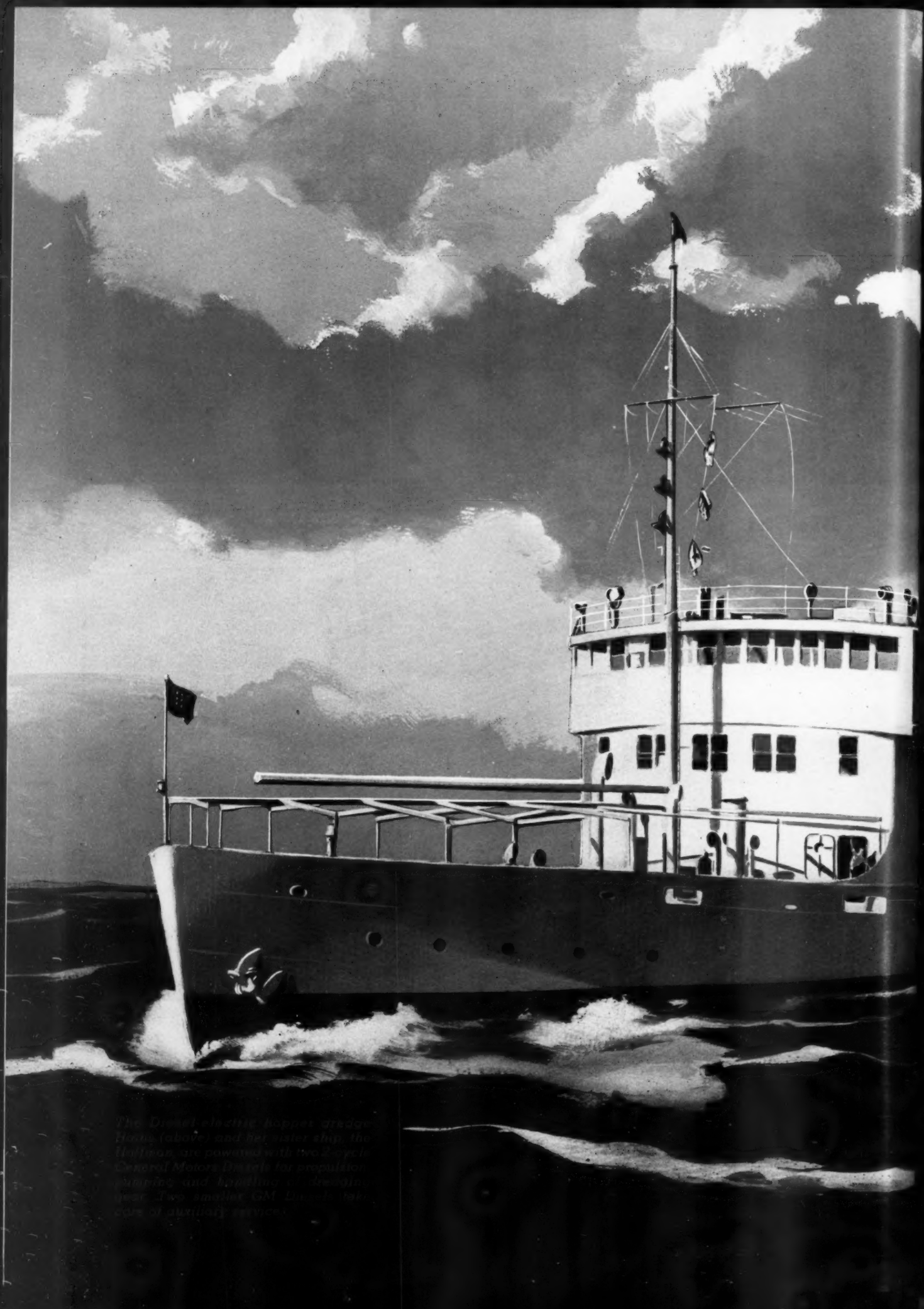
HEMPHILL DIESEL SCHOOL EXPANDED FOR U. S. NAVY

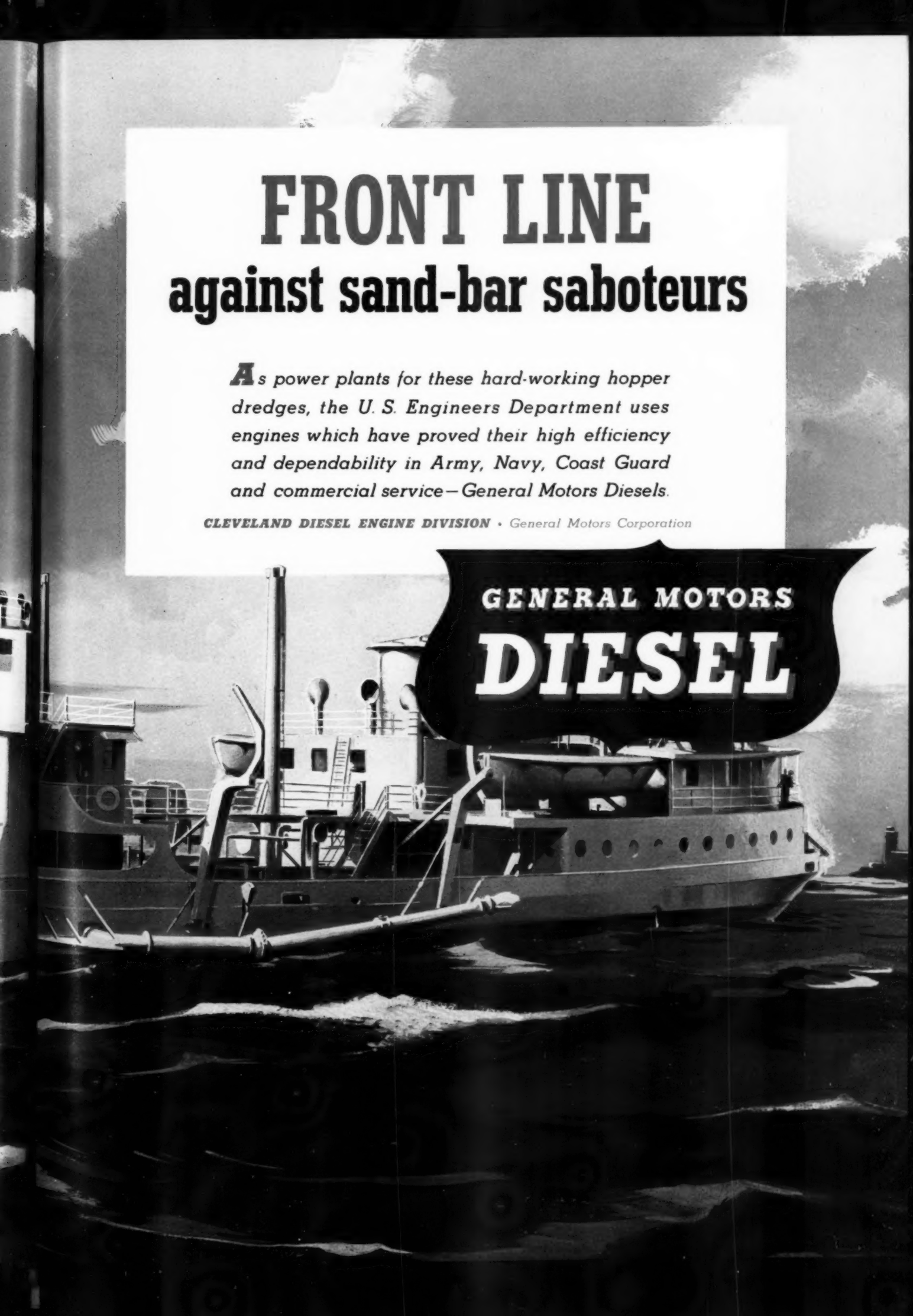
A large playground adjoins the school. A regulation football field and two baseball diamonds make it a popular gathering place for the sailors during the recreation periods.

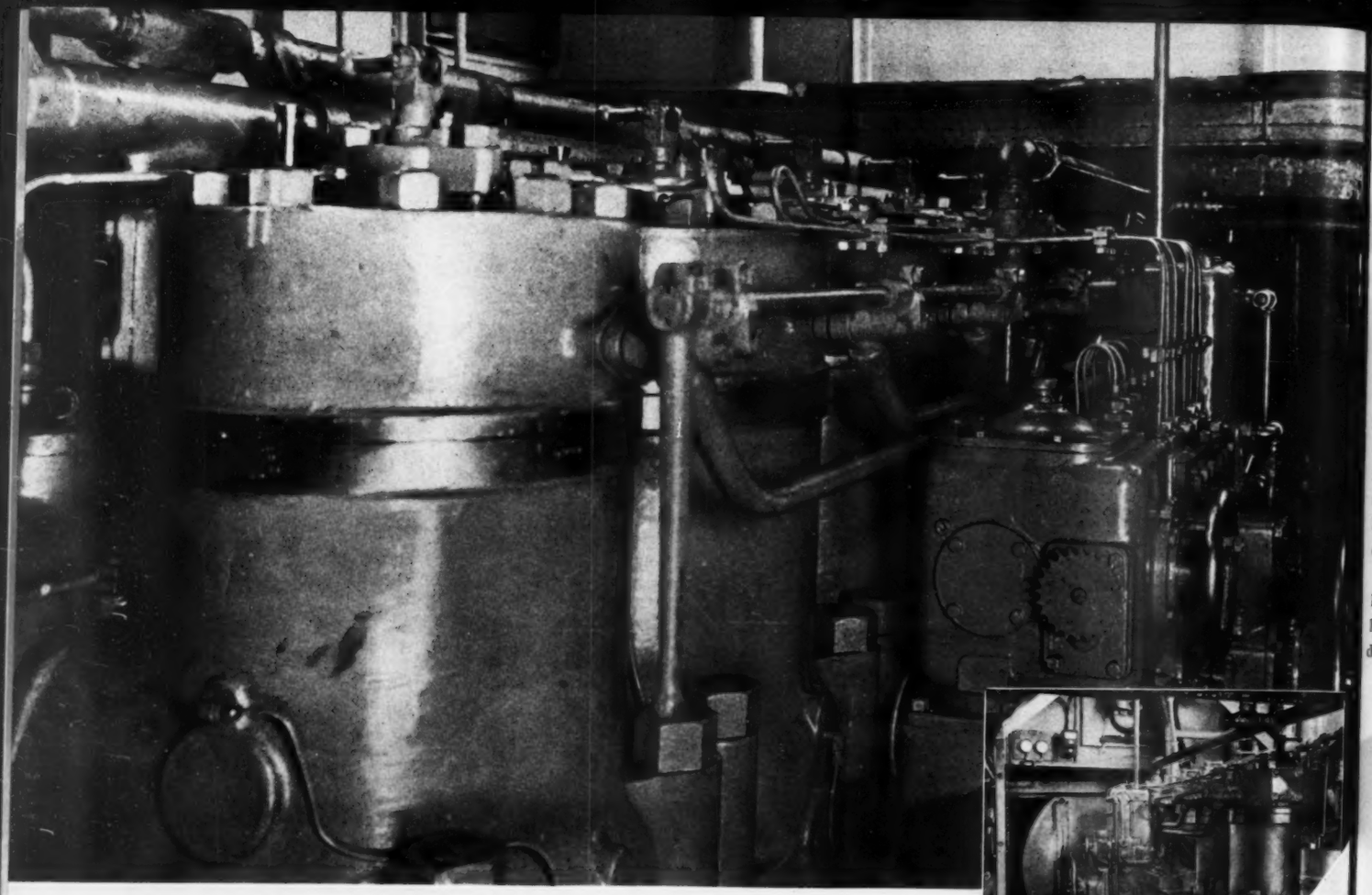
On every successful project the credit for outstanding achievement belongs to a great many people. This is certainly true of the Hemphill Diesel School for Navy enlisted men. Nevertheless, civilians, contractors and Navy officers alike enthusiastically nominate Ralph Hemphill as the man who made it possible, as the one who made it work. His vision, speed and action in organizing and preparing this Diesel educational center for U. S. Navy use is evident in the results and in the quality and efficiency of the men who come out of the school.



Top: View of Diesel engine shop. Center: Ralph Hemphill, President of Hemphill Diesel School, chatting with Lieut. J. F. Welsh, Commanding Officer, and Roy Hemphill, managing director of the school. Above: Ralph Hemphill working with some students. Left: View of the pump and nozzle shop. Below: Students marching to "chow."




FRONT LINE
against sand-bar saboteurs
As power plants for these hard-working hopper dredges, the U. S. Engineers Department uses engines which have proved their high efficiency and dependability in Army, Navy, Coast Guard and commercial service—General Motors Diesels.
CLEVELAND DIESEL ENGINE DIVISION • General Motors Corporation
GENERAL MOTORS
DIESEL



View looking aft along the main F-M Diesel.

TO borrow an advertising slogan, "Something New Has Been Added" to the Henjes Coal Company's fleet of Diesel tugs. A Fairbanks-Morse 2 cycle, slow speed, marine Diesel furnishes the power for this latest arrival, the *Henry Henjes* having entered active service early in July. She is the sister ship of another Henjes vessel, the *Helen Barbara* and is posthumously named after the founder of the Henjes interests, and father of Gerd H. Henjes, present operator.

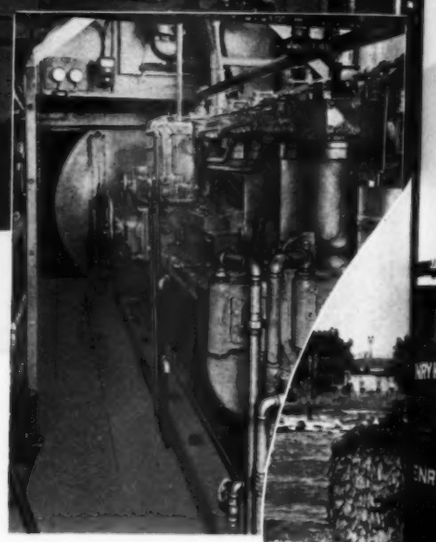
Incidentally, *Helen Barbara,* mentioned above, is now serving in more dramatic work than New York harbor towing, having been purchased by the British Government and at present doing a full time war job in Ethiopia.

The *Helen Barbara* also marked an important change in the Henjes method of operation. Originally, their coal and oil barges were hauled through contract towing. An important switch to self-operation was made in about 1936, developments on this having caused the creation of Henjes Marine, Inc., organized in about 1937. This considerably enlarged the scope of their marine activities to include towing for others, as well as servicing and rebuilding at their own docks.

The already broadened marine developments were further increased with the advent of the *Helen Barbara* which was a converted hull, having been rebuilt and repowered with a F-M Diesel right at the Henjes own dock by their own workmen.

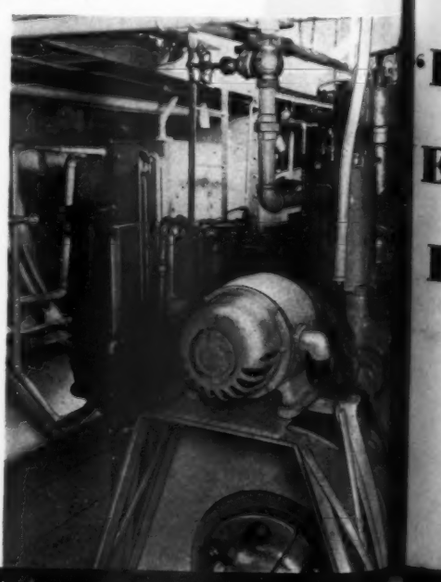
Gerd H. Henjes, ex-Lieutenant of the last war, not only knows the marine game but proves his ideas through actual operation in his own fleet. Located on the outskirts of the poor man's Newport, Coney Island, Henjes is a widely known institution as it should be with seventy-five years of background and experience.

Its latest fleet addition, the *Henry Henjes* is considerably more, however, than just another converted tug. She is a rugged, compact and



Above: Operating side of the main Diesel. Note Michiana lube filter, extreme left, and U. S. Metal exhaust tube, upper center.

After end of the main Diesel showing flywheel generator, center, and switchboard, left.



"HENRY HENJES" EW ADDITION TO HARBOR FLEET

By HENRY A. STEPHENS

trim vessel, with more than a hint of streamlining, yet possessing the businesslike appearance of a sturdy tug. Originally steam powered, she was the former *Louisville*, one of ten fishing company type tugs, built in 1910 at Lorain, Ohio, for the Booth Fisheries Company and utilized on the Great Lakes.

With a length between perpendiculars of 61 feet, a breadth of 16 feet and an 8 foot depth, the *Henry Henjes*, like the *Helen Barbara*, was placed in the capable hands of the Henjes men, completely stripped down to her excellent steel hull and from that point, carefully rebuilt under the supervision of Mr. Henjes.

Her main power unit is a sturdy 6-cylinder, 225 hp. Fairbanks-Morse starboard rotation, direct drive, direct reversible marine Diesel engine, having a 10 in. bore and a 12½ in. stroke and turning at 375 rpm. This engine is fitted with water-cooled exhaust manifold, built-in compressor, built-in reversible centrifugal water pumps for fresh and raw water, built-in fuel supply pump, lubricating oil pumps to handle the clean and used oil and built-in bilge pump. It has force feed lubrication, marine type thrust bearings, forward end shaft extension, standard marine type flywheel, and pyrometer conduit assembly on the engine. A decided engine improvement, since Mr. Henjes powered the original *Helen Barbara*, has been the adoption by Fairbanks-Morse of pressure lubrication to all main and connecting rod bearings.

On the starboard side of the engine room is an auxiliary starting air compressor, driven by a small Wisconsin gasoline engine. Just forward of that is the Michiana lubricating oil filter and, forward of that, the switchboard constructed locally.

In the extreme afterpart of the engine room is the Argoflash heating boiler furnished by The American Radiator Company. Just aft of the auxiliary starting air compressor, separated by a partial bulkhead, is the cooling water heat exchanger for salt water service, supplied by the Ross Heater and Manufacturing Company. L. O. Kovens furnished the pair of 30 in. x 96 in. air tanks found abaft. U. S. metallic flexible tubing was utilized as an exhaust from the engine to the Maxim Silencer equipment. An Alnor Diesel engine pyrometer checks the F-M marine Diesel cylinder exhaust temperatures.

Though her lines are pleasing to the eye, it can easily be seen that the *Henry Henjes* is a tug primarily built for durability and service.

Her quarters comprise a trio of double staterooms aft of the upper engine room, on the main deck. Though small, they are well equipped with double berths and bureau type closing containers for the comfort and convenience of her crew.

In the forward part of the deckhouse is situated the spacious well equipped galley with lockers and extensive storage facilities, a good sized Shipmate range, ice box, galley table with swivel type chairs on one side and a long leather upholstered cushioned seat on the other. This attractive galley and messroom is done in maroon. In going aloft forward, we find the large pilot house. Here the various facilities necessary for the skipper are easily accessible.

A brief trial made directly from Henjes yards along the Bay's seawall was conducted quickly and efficiently in a manner that was a far cry from preliminary trips in the early days of marine Diesels.

Indeed, Captain Culley and Engineer Harry Davis of Henjes, who took her out with a couple of companions (the latter being aboard strictly "for the ride"), handled this latest tug addition in a manner not unlike your next door neighbor taking his new car out for a demonstration in the pre-priority days of 1940. The easy and efficient way the *Henry Henjes* responded to all controls made the trials a real tribute to the builder of her main propulsion equipment.

Cast in grey, with squared air ports of almost military appearance, the *Henry Henjes* leaves in her wake the impression of a tug destined to play an important role in the war effort.

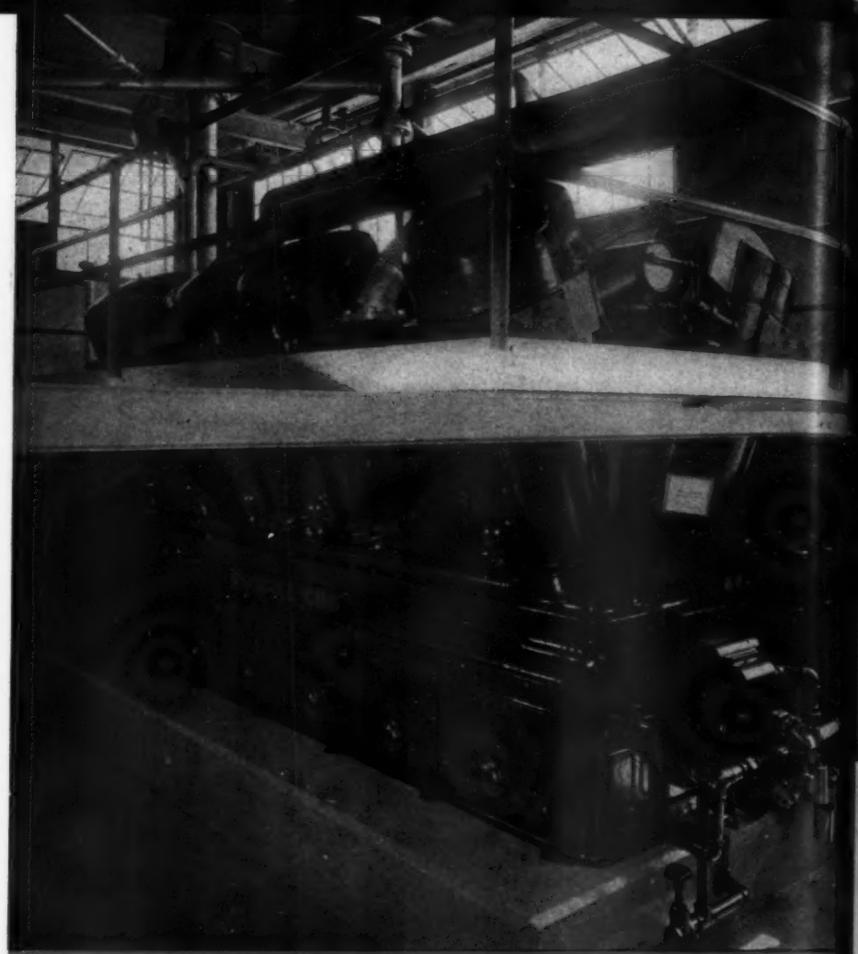
IRRIGATING arable fields presents no power problem in land affected by an annual rainy season. In the Philippines, for instance, where rice cultivation is the source of the major part of the diet, rain during some hours of every day between May and November is to be expected. Plenty of water is caught in the terraced rice paddies on the side of mountains and hills, and gravity supplies the power. Even in the flat lowlands, the high dikes of the paddies hold enough of the heavy rainfall to keep the soil in the proper state of moisture for the growing crops.

A different situation besets the rice grower in this country, however. Rice must have water in order to grow; if the rainfall is inadequate, artificial means must be resorted to. In the thousands of acres of flat country in the Texas coastal plain, the soil is well suited to rice production, provided there is sufficient water for growth of the crop. The climate during the growing season is hot and water evaporates quickly. Approximately twice the amount of water is necessary for Texas rice fields as for fields in the rice-producing section of Arkansas, much farther to the north. In Texas, forty-eight inches of water is the season's requirement; less than half of this amount can be expected from normal rainfall. Accordingly, the supplying of fresh water for irrigation is a sound and essential commercial proposition.

The Texas Public Service Company is a prominent factor in Texas irrigation service, furnishing water to nearly 50,000 acres of rice-growing territory, which includes 3,000 acres of company-owned lands. In the early days of commercial irrigation, the fee for water was collected in kind; two sacks of rice per acre being the accepted price. Later practice has been to charge a flat rate per acre, the price of $7.20 now being set by a state commission.

Besides furnishing water to the rice growers, the company also provides all the fresh water for the city of Port Arthur, Texas, some smaller municipalities and to several large oil refineries in the section. And out of this year-round water service has arisen the need for a simple, practical prime mover that can be used when needed and causes no expense when not in use.

Fresh water is obtained by the Texas Public Service Company from the Neches River a few miles from Beaumont, and is elevated to the necessary levels for irrigation by two pumping stations or lifts. The first lift, No. 1, raises water about 35 feet to the first canal; lift No. 2 raises it another ten feet to the distribution canals. Power was originally supplied by batteries of steam-driven pumps.



Ingersoll-Rand gas engines at Lift No. 1. Note Nugent lube filter and Roper lube pump, extreme right.

Irrigation of the rice fields, however, is only necessary for about five months out of the year, and the power required to supply water for the municipalities and refineries is much less than that required for irrigation needs.

Use of the big steam plants was expensive during the winter, when only partial operation was called for. One attempt to remedy this situation was the use of an electrically-driven pump at lift No. 2. This, however, was no perfect solution as the power charge was $600 a month, whether or not the pump was used.

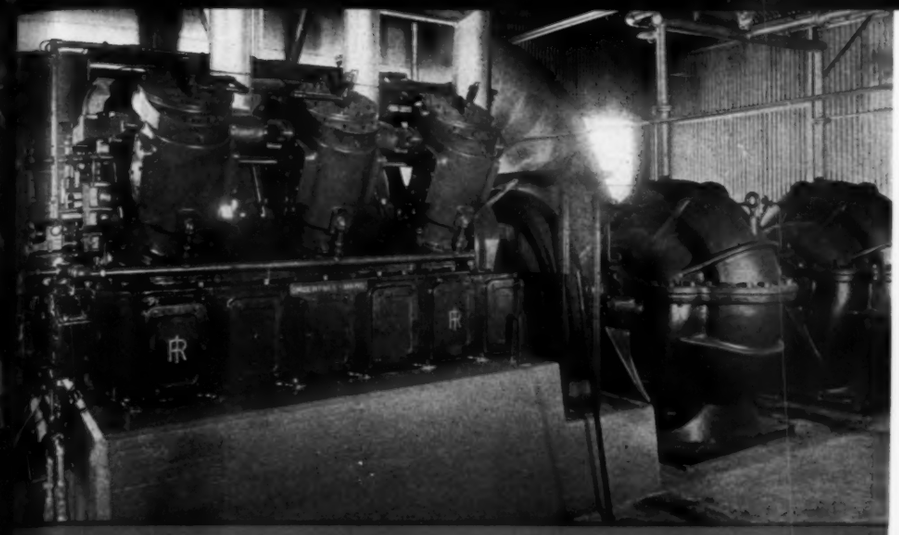
As a real solution for power, which would be economical when used and cost nothing when idle, attention was turned to internal combustion engines.

At lift No. 1 the Texas Public Service Company installed an Ingersoll-Rand engine. This is a V-type of eight cylinders measuring 14½ in. bore by 18 in. stroke; the cylinders being individual and not en bloc. Power developed is 650 hp. at 300 rpm.

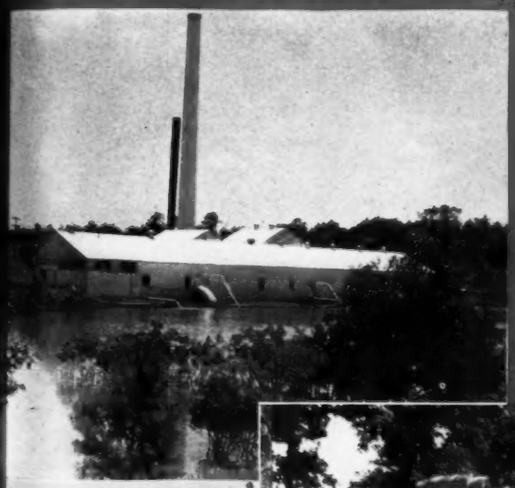
Fuel is natural gas, piped direct from mains to the engine, using a Burgess air filter in the breather pipe. Ignition is by spark plug and American Bosch magneto system. A Pickering governor regulates engine speed, with Maxim silencer installation for the exhaust. Starting is by compressed air, using the Monitor system made by the Monitor Controller Co. According to the plant engineer, starting is very easy. "Just turn it over to the starting point, shoot the air to it, and in two or three revolutions it's hitting on all eight."

For registering engine heat, D. P. S. Co. thermometers are installed on all cylinders and on water lines; a Roper pump circulates the lube oil, which is filtered by a Nugent pressure filter. Lube consumption, says Engineer J. Leblanc, is about five gallons every twenty-four hours; Gulf "Parvis H" is used, and is completely changed every 1000 hours. Engine cooling is closed circuit.

This engine is direct connected through a Falk coupling to a 36 in. pump, also of Ingersoll-Rand make. This pump delivers 50,000 gpm at a head of 36 ft., and is primed by a Nash Hy-Tro pump driven by a Hercules gasoline



Six-cylinder, 192 hp. Ingersoll-Rand gas engine and two IR, 25,000 gpm. pumps at Lift No. 2.



The pumping station at Lift No. 1 receives water from the Neches River, foreground, lifts it 33 ft. to canal, left background.

Main office of the Texas Public Service Company. At extreme left is the high bank of the Neches Canal system.

GAS ENGINES IN *IRRIGATION SERVICE*

By WARREN GLEASON

motor of about 30 hp., which incidentally can also use natural gas for fuel.

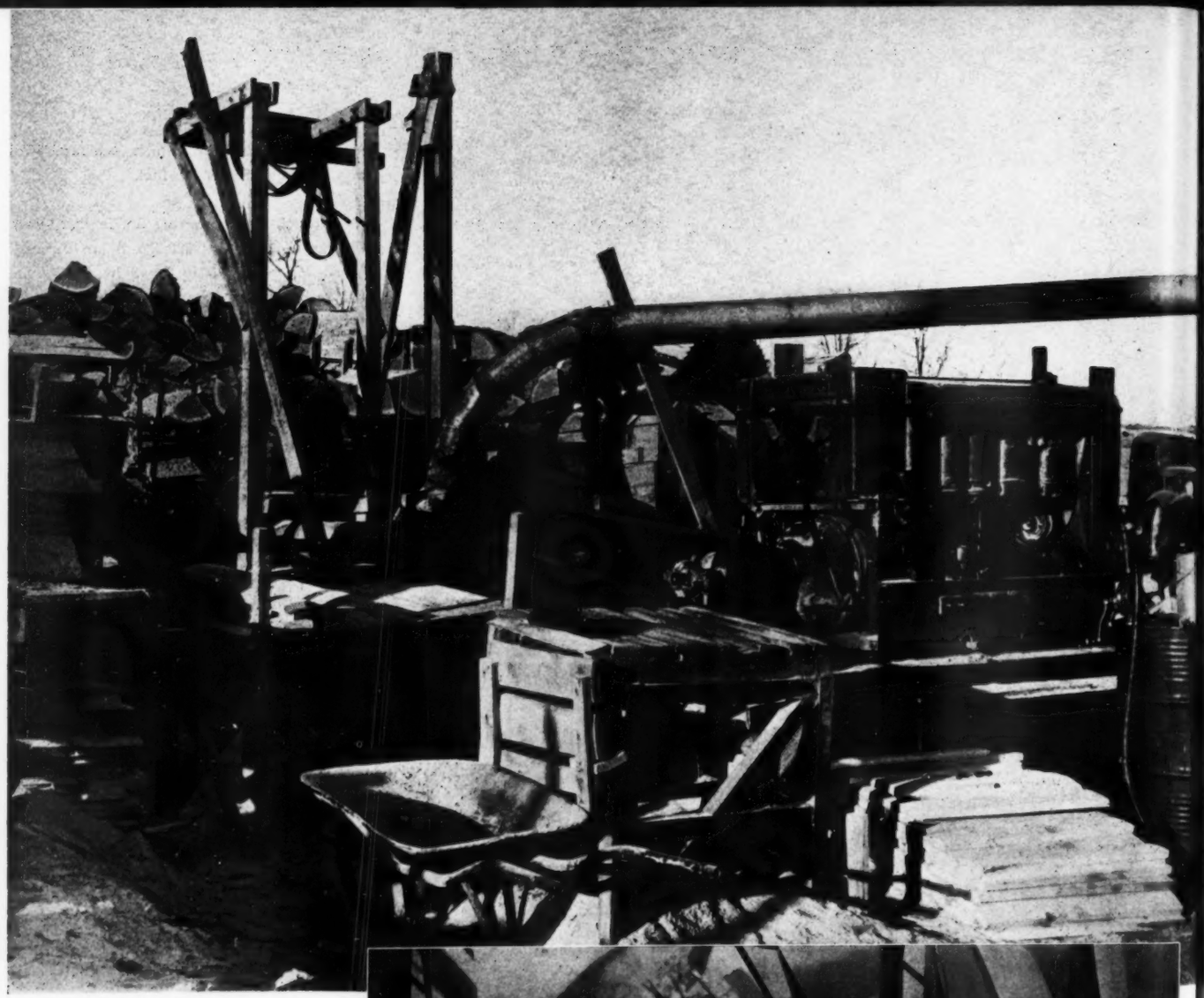
Compressed air for starting the Ingersoll-Rand engine is supplied at 180 lbs. by an Ingersoll-Rand compressor, 5 in. by 3 in. by 3½ in., driven by a natural-gas burning Wisconsin one cylinder motor.

An interesting feature of this whole installation is that this engine and pump give economical winter operation. During the five-month irrigation season, the engine runs twenty-four hours a day, supplementing the steam engines. During the winter the steam plant is idle and the natural gas engine is operated intermittently about seven hours a day, three days a week.

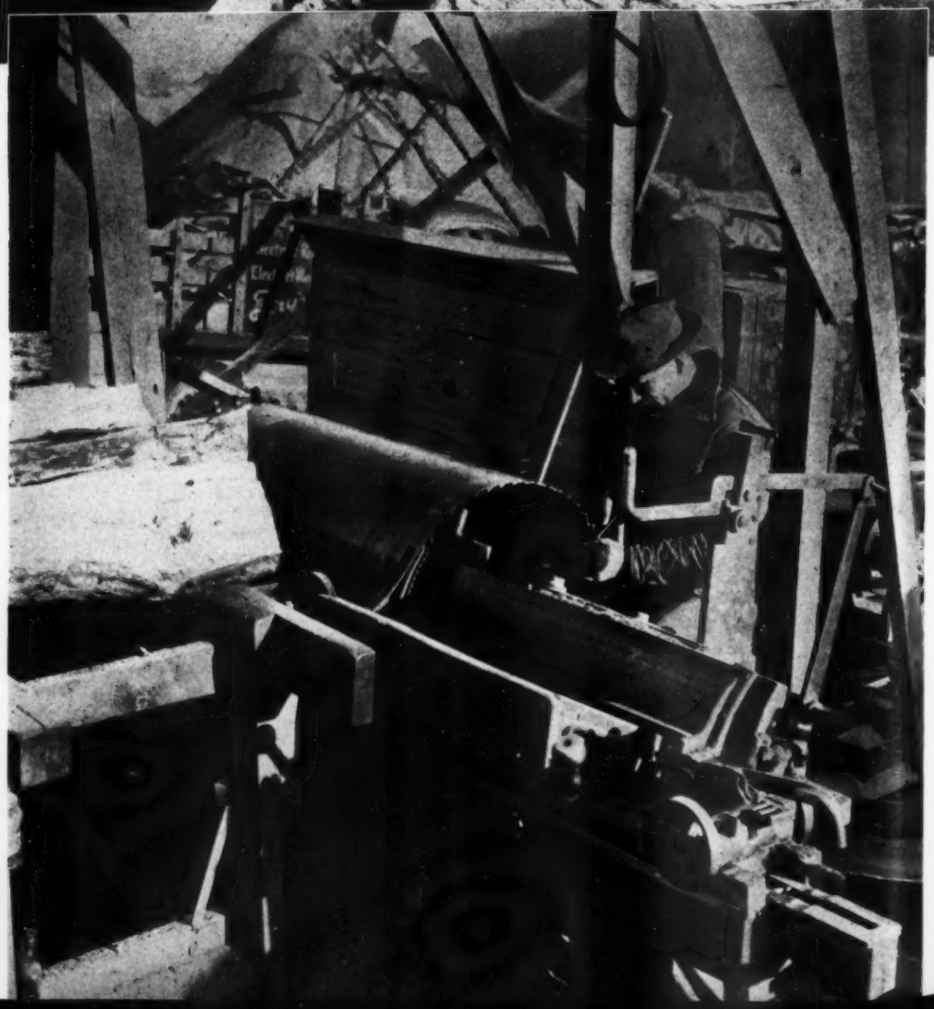
Another interesting aspect of the installation is the protection against flood conditions. The engine room is at a lower level than the steam plant and the Neches River at flood level is considerably higher than the engine room floor. Accordingly the door can be shut water-tight and the engineer has to enter via a ladder and over the wall of the engine-room.

From lift No. 1 to lift No. 2, a canal several miles in length carries the water, where it is again lifted by the second plant. Here, a smaller Ingersoll-Rand has been installed to save winter expense. This engine is V-type also, of 6 cylinder, 11 in. by 13½ in., and governed to 280 rpm. at which speed it develops 192 hp. Likewise equipped with American Bosch magneto ignition, Nugent pressure lube filter and Pickering governor, it is direct connected to a pair of Ingersoll-Rand 25,000 gpm. pumps, producing a 50,000 gpm. rate as at lift No. 1. As the lift at the second station is less than a third of that at No. 1, a lower-powered engine is adequate. The pumping rate, however, must be the same to maintain uniform flow of water.

As to fuel costs, C. A. Trahan, chief engineer of the Texas Public Service Company, advises that $17.00 per day pays for the natural gas burned by the 650 hp. engine at lift No. 1, with the smaller engine at lift No. 2 using less than half this amount. As to maintenance costs, Mr. Trahan points out that after eighteen months of service, both the Ingersoll-Rands were completely dismantled for inspection, "just to see how they were standing up." No repair parts were found necessary, and the only work deemed necessary was a valve grind, an altogether satisfactory situation considering that many months of this operation had been at a twenty-four hours a day rate.



This stave mill unit consists of equalizer, barrel saw, and two edgers powered with a 150 hp. at 1800 rpm. Cummins Diesel.



Filing the barrel saw through which the bolts are fed lengthwise. This cylindrical saw gives the staves the proper curvature.

The equalizer is a pair of saws, spaced to square the ends of the bolts and trim them to a required length.

PORTABLE STAVE MILL SOLVES PROBLEM

By DOUGLAS SHEARING

ONE of the major problems confronting the operator of a stave mill is how to keep the plant operating on a regular schedule. Staves have to be air dried in the yard before shipment to the cooperage companies, as the moisture in the green timber would make freight costs prohibitive. As this seasoning process takes time, the mill's working time is limited somewhat by storage space in the yard.

Freeman Brothers of Eminence, Missouri, have solved their storage problem by Dieselizing their mill and making it entirely portable. In this way, they are able to utilize two yards, moving back and forth between the two. When storage space at one yard prohibits further cutting, the entire mill is loaded onto special trailers and moved to the other yard. By the time the second yard is filled, enough shipments have been made out of number one yard to move back. By this alternating process, they are able to run the mill full time the year 'round, a most suitable arrangement.

In order to insure maximum portability without loss of efficiency, lightweight boxes, representing the various machines, were set up. By changing the positions of these boxes while performing imaginary operations, the most efficient machine settings were worked out and measurements made determining the size and shape of the skids.

Their first Diesel, a Cummins engine, delivering 150 hp. at 1800 rpm., was purchased in 1939, and powers one unit of the mill. This unit, consisting of an equalizing saw, barrel saw, and two edging saws, is mounted on a framework of 8 in. x 8 in. timbers. The engine skid is also bolted to the framework and powers the saws through a short line shaft. The manner in which these saws operate can best be seen in the photographs. The equalizer consists of two saw blades mounted on a single spindle and is used to cut the bolts of white oak to the proper length. The bolts are then fed lengthwise into the barrel saw, which forms the proper curve in the staves. As each cut is completed, the bolt drops down for the next cut, this operation being repeated until the log is gone. After the staves are sawed to the proper length and curve, the edges are trimmed on the two edging saws, and they are ready to be stacked in the yard for drying.

The second engine, also a Cummins Diesel, purchased in 1940, powers a second unit, consisting of a heading saw and two edging saws. The heading saw is an equalizer with the blades on a shorter spindle, and cuts short bolts to be used in making barrel heads. As these head staves are flat, no barrel saw is required on this unit and the bolts are merely ripped and the edges trimmed.

Each of the two engines use approximately 35 gallons of fuel per day, costing 8.2c per gallon, or a total operating cost of $5.74 per day for both engines. Fuel is pumped to the engines from 50 gallon oil drums which are filled from a tank wagon.

The portable mill has a capacity of 1,000 staves per hour and, at the present time, it is being run 48 hours per week. Most of the production is shipped to the Motor Wheel Corporation, Memphis, Tenn., where the staves are kiln dried and made into whiskey barrels.

Freeman Brothers also own a stationary stave mill in which steam power was replaced by a Cummins Diesel. In this mill, the Diesel is belted to a line shaft powering all of the machinery, a compact working plan.

The scrap from all of the mills, which was formerly used as fuel, is now sold, given away, or burned, as the Diesels have proven more economical than steam, even when the scrap was used as fuel.

A SEAMAN TAKES UP TUGBOATING

By

WARREN GLEASON

WHEN he was fifteen years old, O. W. Kohlmeister wasn't very well satisfied with the way things were going at home and decided to do something about it for the benefit of his future, which didn't look too bright.

He did it the hard way, that of the sea. After a series of adventures, which would make some fiction heroes appear somewhat colorless, he eventually landed a berth as cabin boy on an ocean-going sailing vessel, where he proved that he could take everything that came his way. The sea was tough but he was no softie himself.

He went through the whole routine, from the forecastle to the after deck, from sail to steam.

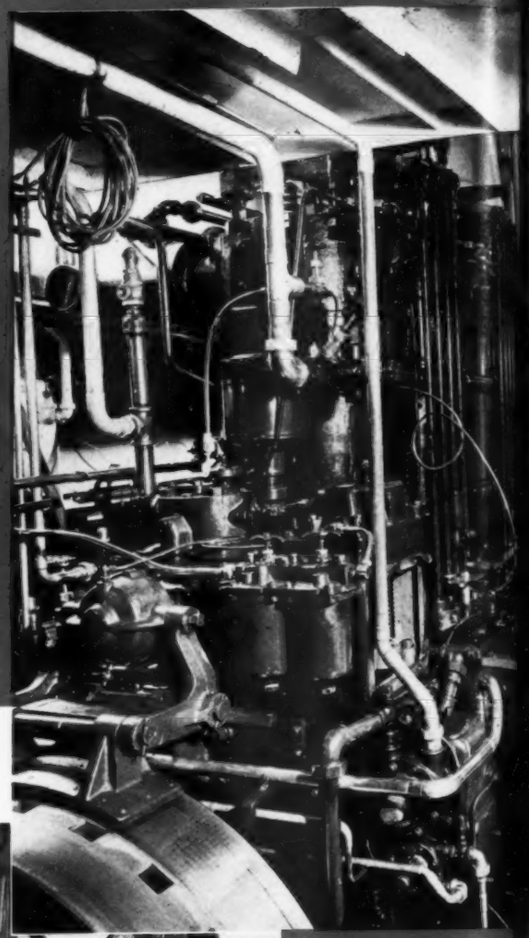
For thirty-five years he sailed under one house flag, that of the Dollar Line, becoming not only a master but the captain of the finest ship in the fleet, the *President Coolidge*. No finer liner ever carried the American colors.

A couple of years ago, Captain Kohlmeister decided to quit the sea, so far as 'round the world cruise ships were concerned, but he was still far too active a man to consider idle retirement and decided to have a house flag of his own.

In a Texas port he found a tug with possibilities, a Diesel vessel which he improved and renamed the *Progress*, and then he went actively into the tugboat business. And business was good. Soon after, he made the acquaintance of the marine firm of Arthur Duvic's Sons in New Orleans and, with their co-operation, a new steel tugboat hull was located under construction, as was a new Diesel for which another hull was not ready. The combination was gotten together into the new tug *Peggy Wilson* for which a trial contract was secured in the petroleum field.

Captain Kohlmeister followed this contract with such assiduity and delivered such an excellent performance that the oil firm practically gave him carte blanche all the oil-towing that he could find means to handle. This called for more tugs and barges and, on the basis of previous satisfactory dealings, the new business went to Arthur Duvic's Sons. Two more tugs were contracted for, to be 75 ft. overall length with a beam of 19 ft. and a draft of 7 ft., of all-steel construction including deckhouse and pilot house.

The Duvics turned the building job over to the firm of F. B. Walker and Sons of Pascagoula, Mississippi, whose yards have turned out many tugs of outstanding performance. Hull design was by Arnold Walker of the building firm,



In this view is seen the Atlas Imperial, 400 h main Diesel with Purolator fuel filter in the fo ground and Alnor pyr meter upper center.

A corner of the comfor ably equipped, well ven lated crew's cabin.

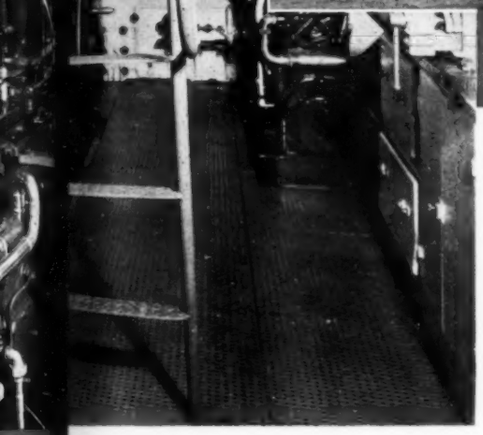
Pilot house view showing radio telephone compartment and Weston tachometer.

with cabin arrangements specified by Captain O. W. Kohlmeister.

The power plant selected was an Atlas Imperial Diesel of six cylinders, 13 in. by 16 in., air-starting and direct reversing, developing 400 hp. at 300 rpm. The entire engine-room layout, engineered and installed by Arthur Duvic's Sons, represents every possible consideration for continuous efficient performance.

An Alnor pyrometer is installed for registering working temperatures of each cylinder. Wes-

This one of two new all-steel Diesel tugs embodying some new features. Note the rather short deckhouse which permits placing towing bitts well forward.



ton tachometer gauges are installed both in the engine-room and pilot house. Lube oil is protected by Nugent pressure filters. Cooling is closed circuit, using a Sims heat exchanger; a Wyman reversible pump circulates raw water to the exchanger, the cylinder-cooling water being circulated by built-in pump on the Atlas.

Electric current is supplied by a generator driven from the main Diesel and by a 3 kw. Ideal Diesel generating set, in which is also incorporated a two-stage Quincy air-compressor and a 2 in. fire pump, V-belted and clutched. Fuel transfer is by an Oberdorfer electrically-driven pump.

Batteries are Edison, with a switchboard designed and built by the Duvics. In the engine-room also is the ship's heating plant, a Crane oil-burning heater supplying hot water to the radiators throughout the boat. For heavy towing service, a Kingsbury thrust bearing is fitted to the propulsion engine. The propeller installed is a specially designed three-blade Columbian Bronze, of 74 in. dia. and 40 in. pitch. Other equipment includes the Sunflame butane gas stove in the galley; Graybar Hotpoint electric refrigeration; manual steering gear., using all-bronze reduction gears designed by the Duvic organization; RCA radiophone; Cunningham air-horn; Carlisle-Finch searchlights; Crane bathroom and plumbing fixtures.

As to performance, the new *Louisa* has towed 26,000 barrels of oil—which is 1,092,000 gallons or a train load of big tank cars a mile long—from a Texas port through the Intracoastal Canal to New Orleans in 88 hours: A marked tribute to hull design and the Atlas Imperial Diesel. Performance of the sister tug, *Commodore,* details of which will also be available shortly, is expected to be also impressive.

The Kohlmeister organization, operating as the Southern Tug and Barge Company, is unique. Captain Kohlmeister's "right-hand man" is none other than Mrs. Kohlmeister, who, according to the captain, "does all that any perfectly efficient sectretary could ever do, plus a great deal more." Mrs. Kohlmeister is a busy executive of the firm.

Galley design and equipment, cabin design, interiors and the like are her special province. When the first tug, *Progress,* was equipped, Mrs. Kohlmeister held out for a thorough housecleaning, for the installing of inner-spring mattresses for the crew, for the furnishing of pillow slips, bedspreads, towels and so on. Sissy stuff, some of the competitors said, which was not in the least true as results showed, for Kohlmeister officers and crews have proved that men appreciate cleanliness.

Mrs. Kohlmeister also functions as chief steward and purchasing officer. Galley supplies for Kohlmeister boats sound like the purchase orders for a de luxe restaurant. Nothing but the best is bought and stored in the firm's own cold storage ready for the boats.

Kohlmeister crews are composed of the best men in the tugboat field; there is a long waiting list, with no openings at present available because no men ever want to quit. This firm uses a vacation system for its employees; many of the officers and seamen are from distant points; a system has been worked out so that after every thirty days of work, a man is allowed ample leave with pay to visit his home; after this rest period, men are refreshed and ready to hit the ball again. Other tugboat firms now use this system which the Southern Tug and Barge Company instituted for the benefit of its employees and, as it proved, of the company.

Every vessel, on every trip through New Orleans is met by Capt. Kohlmeister personally. If any difficulties occur on any tow, the captain charters a plane and gets there for first-hand information. This tugboating venture is being conducted according to the captain's experience in steamboating; there is a proper department and department head for every activity of the firm, according to the teachings of Robert Dollar, to whom Capt. Kohlmeister affectionately refers as "Father Dollar," and for whose ability as a builder and executive Capt. Kohlmeister has abiding respect.

It is conservative to predict a bright future for the Southern Tug and Barge Company and its fleet of Diesel towboats. Capt. Kohlmeister, for all of his thirty-five years of seafaring, is today only fifty-two years old and could easily pass for fifteen or twenty years younger. The boats under his house-flag are destined to be important factors in Southern water travel.

DIESEL ELECTRIC WATER WORKS

By GLENN C. BOYER

Left: Front view of the Kearney, Nebraska, powerhouse. Above: Well house for Well No. 6, located in one of the city's four parks. Right: One of the De La Vergne, three cylinder 300 hp. Diesels.

MIDWAY between Boston and Los Angeles on the Lincoln Highway lies Kearney, Nebraska. Located in a prosperous farming section of central Nebraska, this community of 10,000 population gets scant attention from the passengers on the Union Pacific transcontinental streamliners which travel at high speed through this fertile Platte river valley. The Diesel streamliners, however, are but an addition to the field for the Diesel engine which is no stranger in their midst. Since 1924, they have employed Diesel-driven generating equipment to provide the power required for the operation of their waterworks.

Most of us are accustomed to thinking of the Diesel engine as being used predominantly in the electric utility, industrial power plant, automotive, and marine fields, but here, for eighteen years, two De La Vergne 300 hp. units have been providing the power for pumping the wells which furnish this Nebraska city with its water supply. Water means much to these people of central Nebraska. Irrigation is necessary in order for them to grow trees, lawns, gardens, or any agricultural crops. Thanks to the proximity of the Platte river and the geological formations underlying this community and the adjacent territory, wells can be dug practically anywhere. It is seldom necessary to go deeper than 60 to 80 feet to obtain suitable water, and wells are used extensively for irrigation as well as for the community's water supply.

Before the Diesel plant was constructed for the city in 1924, steam engine driven pumping units were employed for furnishing water. This was an uneconomical method of water pumping. When it became necessary to modernize the pumping equipment, Diesel-electric generating units were selected to produce the power needed for pumping.

At the present time, seven wells are used for supplying water to the community. One well is located within the power plant while the other six are scattered throughout the city. Four 2,400-volt circuits on pole lines owned by the city transmit the power to the six wells outside.

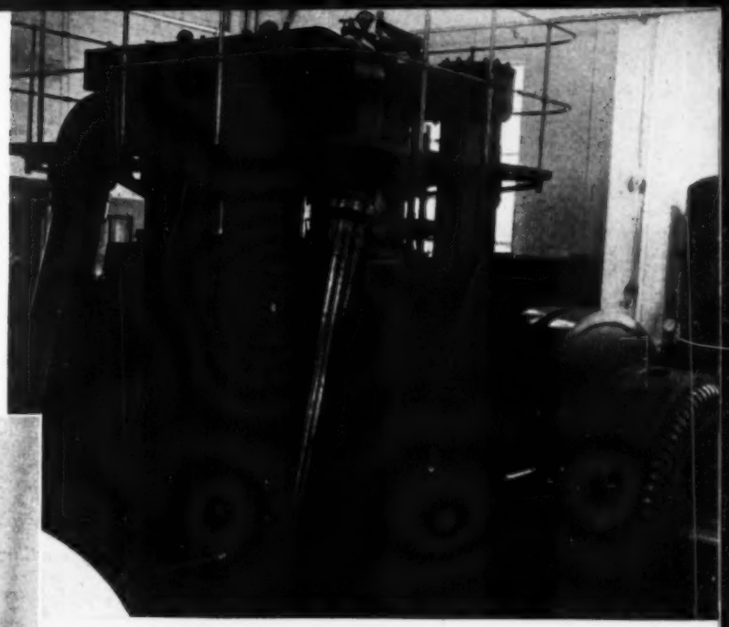
Each well is housed in an attractive brick or stone building. One of the wells is situated in a public park, and this well house was designed to harmonize with the other buildings and structures provided for the public.

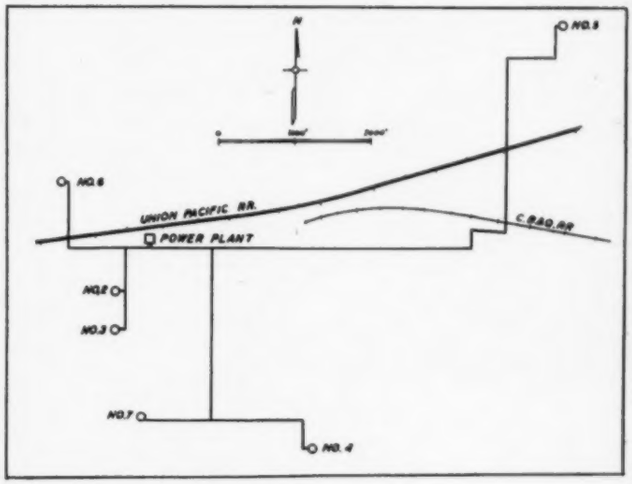
The power plant is a brick structure consisting essentially of an engine room and a single-story addition which is used for a plant shop and water-meter test and repair shop. It is well lighted and ventilated, and while the building has been doing service for eighteen years, it has been maintained in excellent condition. The general proportions of the building are very similar to those being built today. A hand-operated traveling crane is provided for maintenance and repairs of the two engine-driven generating units.

The engines are De La Vergne, 17 in. x 24 in. three cylinder, four-stroke cycle, operating at 225 rpm. Each engine drives a Westinghouse 250 kva., 200 kw., three-phase, 60 cycle, alternator. The plant output ranges from 3,700 to 3,800 kwh. daily, and is determined by the demand for water in the community.

In general, the water delivered averages approximately 2 mgd. and the maximum delivery is approximately 3.5 mgd. A reservoir, located on high ground at the northwest corner of the city, floats on the system to equalize the pump-

Right: Exhaust side of the second De La Vergne Diesel. Seen also in this view is one of the two Westinghouse 200 kw. generators. Lower right: Layout of power lines between powerhouse and seven wells.





ing rate and to provide an emergency water supply for fire protection.

Cooling of the engines is accomplished by using water from the supply system. This cooling water, taken directly from the system at approximately 55 degrees F., is passed through the engine jackets and discharged into the sewer with no attempt made to reclaim the water used for cooling. The water temperature off the engines ranges from 70 degrees to 90 degrees F., depending upon the load. While the water is high in mineral content, little scaling difficulty has been experienced with this cooling system because the water temperatures are maintained at extremely low values. Apparently these low water temperatures have caused no difficulties in the operation of these engines.

Viscous-type air filters are employed, and both engines take their air suction from a common air filter housing. There is little difficulty from this arrangement since under the operating schedule employed, it is possible to shut down the plant for short periods for such air filter repairs or cleaning as may be necessary.

Exhaust mufflers are not used with these engines. The exhausts from both engines discharge into pits located under the engine-room floor. These pits are filled with coarse rock to provide multiple paths for the exhaust gases. Exhaust stacks connect from these pits to the atmosphere and discharge above the engine-room roof. While such a system of exhaust muffling would hardly be considered today, it is surprisingly effective with the engines installed, and little exhaust noise is heard even on the plant grounds.

Motors on well pumps are started and shut down manually, and no automatic control is, therefore, employed between the wells and the power plant. The superintendent of the system prefers to have a man actually inspect the well at the time it is put into operation and consequently the manual starting and shut down are employed. Since four circuits are used for the electrical supply to the six wells located outside of the plant, the operator on shift can readily detect changes in load on a particular feeder and determine which groups of wells is not functioning correctly. A service man dispatched to the group of wells in question can quickly find out which well is not operating and take the necessary steps to place the well back in operation or fix the damage.

This plant was designed by the Burns & McDonnell Engineering Company for the City of Kearney, and is under the direction of Mr. Ralph Lancaster, superintendent of the water department.

Above: Caterpillar Diesel tractor mounted high lift shovel handling heavy rubble. Below: Caterpillar Diesel grader. Bottom: LeTourneau Carryall with cable controls hooked up to power take-off on Caterpillar Diesel tractor.

DIESELS PUSH STEEL MILL PROJECT

By JIM MEDFORD

THERE'S a Gargantua job of work started out at Fontana, California, where Henry Kaiser, that wizard for turning things out in a hurry, is creating a fifty million dollar steel plant where 70,000 hogs mellowed the ground for the giant "Cats" that are moving more ground now in an hour than all those grunts snooted in their life-time. Slogging along between stands of tall Eucalyptus wind breaks, with clanking treads and roaring exhausts, the "Cats" buck and fling paydirt like nobody's business under the expert hands of their skinners who handle them as if they were so many empty wheelbarrows. Caterpillar Diesels are doing their part in converting this former hog ranch into a center of industrial activity including the building of thirty miles of railroad grade. Ten pieces of Caterpillar Diesel equipment are in service on this project at a fuel cost of 4½ gallons of 5½ cent fuel per hour for the heaviest units. These are Caterpillar 6 cylinder, 113 drawbar hp. Diesels.

This 80 hp. Atlas Imperial Diesel, supplies power and light, also heats and cools the mill, garage and office.

Coxsackie (New York) Milling and Supply Corporation mill and office, right, and garage, left, which is 100% Dieselized. See diagram of heating and cooling arrangement bottom of this page.

HEATING, COOLING, POWER AND LIGHT

AN eighty-horsepower Atlas Diesel is performing the triple duty of not only furnishing power and light for the Coxsackie Milling and Supply Corporation of Coxsackie, New York, but has taken on the additional job of supplying heat in the winter and air conditioning in the summer.

Head of the milling company, J. O. Yeoman first conceived the idea of his Diesel taking on the added burden of furnishing heat and cool air in the two seasons approximately eight years ago. He could see water used to cool the engine becoming hot, and it bothered his thrifty soul that so much heat should go to waste, when it required hundreds of dollars each winter to supply fuel to heat the mill and adjoining garage, also a molasses tank. The tank was the first object of Mr. Yeoman's experimentation when a small thermostatically controlled heating coil was placed in the molasses container. This performed so efficiently it was decided to attempt to heat the office with water from the Diesel. A few radiators were installed, and the first attempt did not meet with the success it was hoped for and expected, which was quite disappointing.

After studying the matter for some time it was concluded the size of the pipes was not sufficient to allow for the proper flow of water from the engine jacket to the radiators. The pipe size was increased to two inches, and that problem was solved. Then additional radiators were installed, a larger pump connected, and throughout the mill and garage today more than twenty radiators receive hot water generated by the Diesel and, despite the severe winters of upper New York, employees declare they are kept comfortable regardless of freezing outside weather.

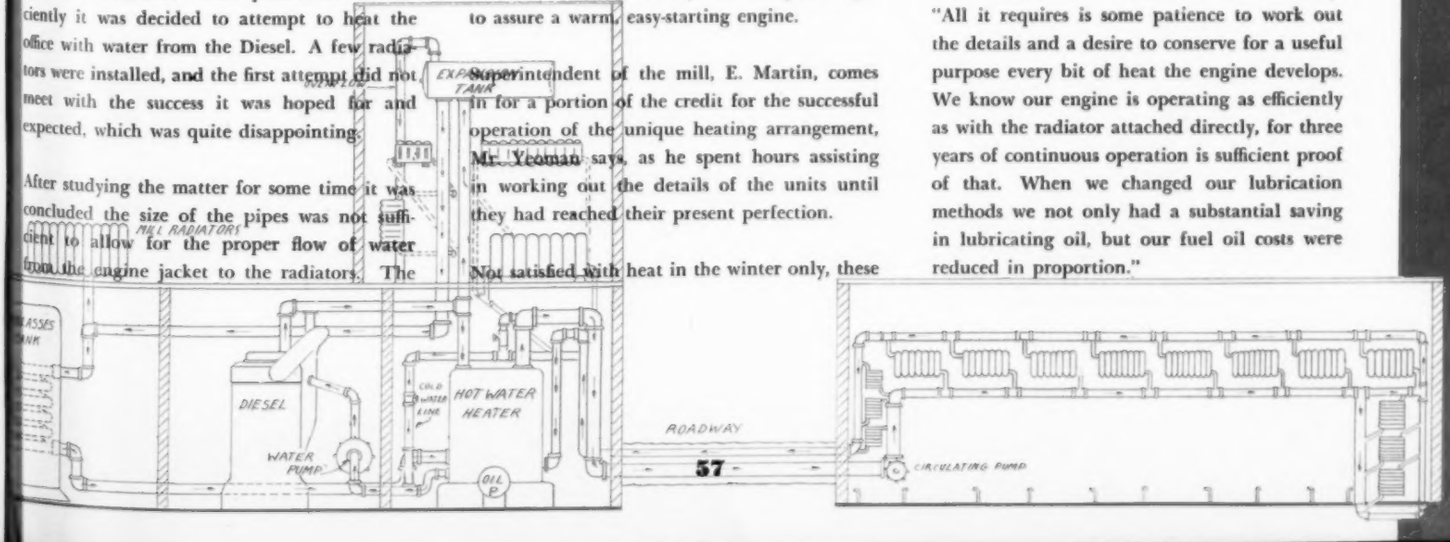
Water to the garage is piped a distance of fifty feet, and a series of wall radiators provide comfortable working conditions. The entire cost of installing the system has not exceeded one thousand dollars, Mr. Yeoman's records reveal, and the cost was saved in fuel purchases and increased working efficiency during the first two years of operation. A thermostat in the garage regulated the heat for this portion of the buildings, and is used only at night. A small auxiliary boiler adjoining the Diesel, equipped with a fuel oil burner, is rarely used except at night to assure a warm, easy-starting engine.

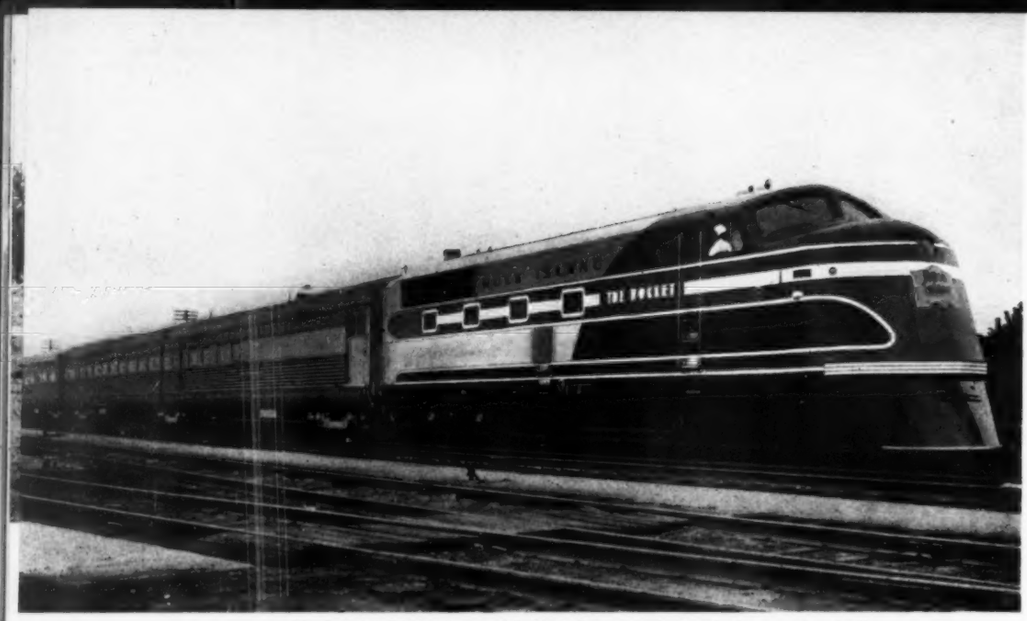
Superintendent of the mill, E. Martin, comes in for a portion of the credit for the successful operation of the unique heating arrangement, Mr. Yeoman says, as he spent hours assisting in working out the details of the units until they had reached their present perfection.

Not satisfied with heat in the winter only, these men devised a method of reversing the flow of water to the motor, and in the summer time cool water flows through the radiators, which has reduced summer temperature in the office and mill more than twenty degrees.

When the new duties were added to the Diesel, it became essential that the engine always be in smooth running condition, as a shutdown in the winter could be most harmful and expensive. Lubrication engineers were called in three years ago and superintended the rebuilding of the engine. Macmillan Ring-Free Motor Oil has been used since that time, and the motor while performing all of its heavy duties has not had one shutdown of any kind, and lubricating oil consumption has been reduced to approximately two quarts of oil a day.

"Any other Diesel owner can accomplish the same results," Mr. Yeoman declared recently. "All it requires is some patience to work out the details and a desire to conserve for a useful purpose every bit of heat the engine develops. We know our engine is operating as efficiently as with the radiator attached directly, for three years of continuous operation is sufficient proof of that. When we changed our lubrication methods we not only had a substantial saving in lubricating oil, but our fuel oil costs were reduced in proportion."





Rock Island "Rocket" with 1200 hp. Diesel-electric locomotive built by General Motors with electric equipment by General Electric.

DIESEL LOCOMOTIVE MOTORS, GENERATORS AND CONTROLS

By J. W. TEKER *

EDITOR'S NOTE:—Paper presented at the Northeastern District Meeting of the American Institute of Electrical Engineers at Schenectady, New York.

THE Diesel-electric locomotive, comparably new to the field of railway motive power, has attained full recognition in record time. It made its beginning in switching service, where it has slowly but indisputably proved its superiority over other motive power. Its recent rapid growth started during the depression years when it invaded main-line passenger service, initiating the streamliner era in railroading and winning a position on the timetable unequalled in railroad history.

The fundamentally sound combination of an efficient Diesel-engine prime mover coupled with the practical and reliable electric transmission made a locomotive of high availability and sustained horsepower, permitting greater acceleration and longer mileage runs between fuel and water stops. Such locomotives ignore division points on railroads and pull their trains from terminal to terminal. Today this motive power is spreading into the field of main line freight service.

The Diesel engine converts the energy in fuel oil directly into mechanical energy by internal combustion, the heat energy expanding gases in the engine cylinders to move pistons. The reciprocating motion of the pistons is modified to rotary motion by means of connecting rods working on a crankshaft. The result is a prime mover of comparatively compact proportion, light weight, and high efficiency.

The Diesel engine is not self-starting. It has no torque at zero speed. It must be cranked up to firing speed, after which it will continue to operate and deliver power essentially at constant speed and torque and, therefore, at constant horsepower. Since it has no torque at zero speed, it cannot start a train, so a transmission is necessary to make the Diesel engine a practical prime mover for locomotives and to provide means for converting the available power into starting torque at the drivers and then exchanging torque for speed as the train is accelerated. The importance of the transmission is evident, for without it there is no Diesel locomotive. The transmissions fall into two general classifications: mechanical and electrical.

The mechanical scheme takes the form of a selection of gear ratios with provision for reversing direction of motion and a clutch mechanism to release the gear load while a shift is made from one ratio to the other. The automobile transmission is the best example of this. When a grade is encountered where the train demands more tractive effort than the gear ratio being operated in permits, the Diesel engine will stall, unless a backward shift is made to a higher gear ratio. This form of operation, familiar to the many drivers of automobiles, is practical until attempts are made to handle heavy trains and high horsepowers. The steps in such a speed-tractive effort curve will not permit full utilization of available horsepower. The practical difficulties encountered with clutches and gear transmissions have limited the application of mechanical systems.

The electric transmission made possible the application of Diesel engines to heavy traction. A direct-current generator, coupled directly to the Diesel engine, converts the mechanical energy into electric energy which, by suitable wiring and control, is passed into electric motors geared directly to each driving axle, where the energy is reconverted to mechanical energy to move the train. This arrangement permits operation of the Diesel engine at full speed and horsepower over the working range of the locomotive. The electric transmission provides high tractive effort at zero speed for starting trains and is ideal for railway work since it exchanges torque for speed as the train demands, without necessity of gear shifting.

The series motor, most commonly used for traction purposes, is ideally suited for railway work because of its inherent characteristics. The armature is connected in series with the exciting field so that, as the load on the motor is increased, the current rises in both armature and fields and the motor slows down because of the increasing field flux for the generation of counter-electromotive force. At the same time it develops torque more than proportionate to the rise in current. Such a characteristic has a tendency to keep the horsepower constant by exchanging speed for torque. These motors are equipped with interpole windings for commutation stability over varying field strengths and speeds.

Traction motors are commonly mounted directly on the locomotive axle, which is driven through a gear on the axle and a pinion on the end of the armature shaft. This system of drive permits various gear ratios to be applied so that a locomotive may be geared for switching service, freight service, or passenger service by simply changing the gear ratio. The axle suspension bearings are built into the motor's magnet frame, thereby rigidly maintaining the gear center distance. The torque reaction of

* *Transportation Engineering Department, General Electric Company.*

e motor on the axle is taken through a otor-suspension bracket on the locomotive uck.

raction motors are under the locomotive, ose to the road bed, and are subject to shock, ibration, flying gravel, and exposure to all pes of weather. The construction must, herefore, be sturdy and ironclad to withstand hese adverse operating conditions.

The limited space between the locomotive rivers, imposed by the track gauge and the ecessity for maintaining clearance to the road ed, demands an extremely compact design ith just enough accessibility to reach the com- utator surface and the brush rigging for maintenance.

The conversion of high electrical horsepower o mechanical energy is attended by losses which appear in the form of heat. To prevent he overheating of the materials packed into his limited space, it is accepted practice to have blowers in the locomotive cab ventilate the motors through a flexible duct system.

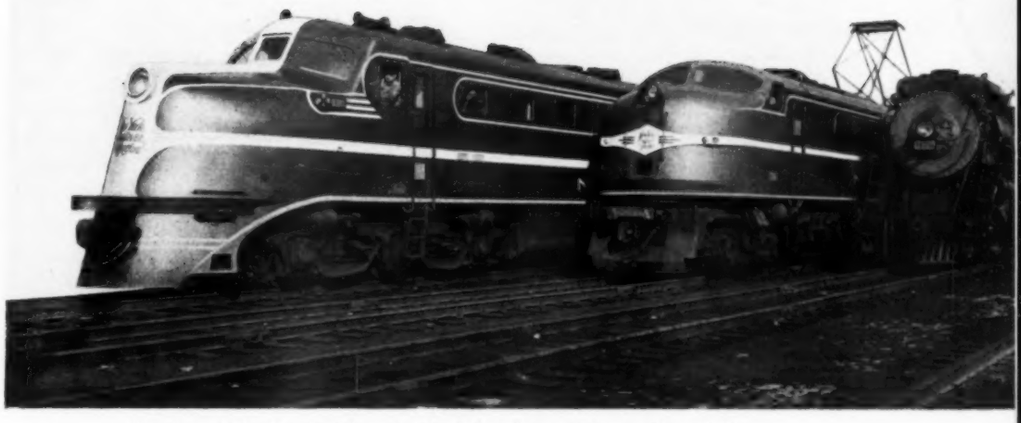
Cooling air, blown under pressure into the commutator end of the motor, flows through the motor by two paths. One path is over the commutator, around the field coils, and through the air gap. The other path is under the commutator and through the armature core vent holes. Both streams are then discharged through openings in the pinion end of the motor.

The axle bearing linings are oil lubricated by means of wool waste wicks which raise the oil from a reservoir in the axle cap and by contact spread a film of oil on the journal surface. The axle bearing caps are bolted in place and hold the bearing linings which are split in halves so that the motor is removable from the axle.

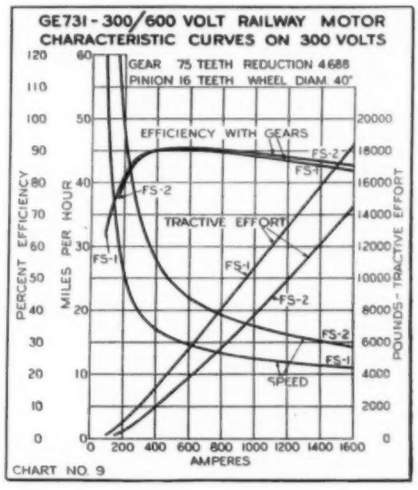
The gear case encloses the motor pinion and axle gear. The bottom of this gear case serves as a reservoir for the gear lubricant into which the gear dips and carries the lubricant to the gear mesh.

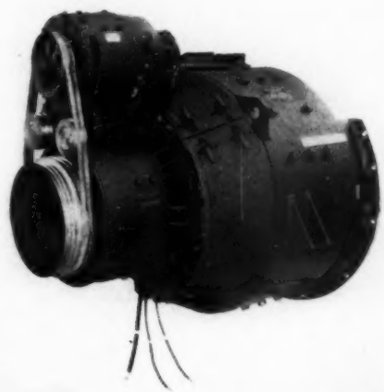
The motor armature is supported on grease-lubricated roller bearings. The armature end thrust is taken by the commutator end bearing. The pinion end bearing is free, to allow for expansion of armature shaft length with respect to the motor frame, and is large enough to carry the gear reaction.

The Diesel-electric traction generator converts the mechanical output of the engine into electrical energy for use by the motors. Since the motor current varies with the tractive effort demands of the train, suitable means must be

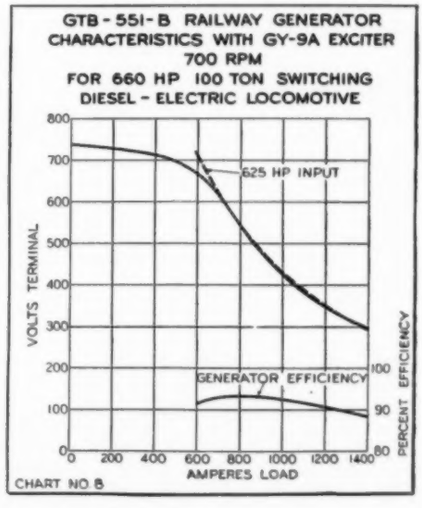


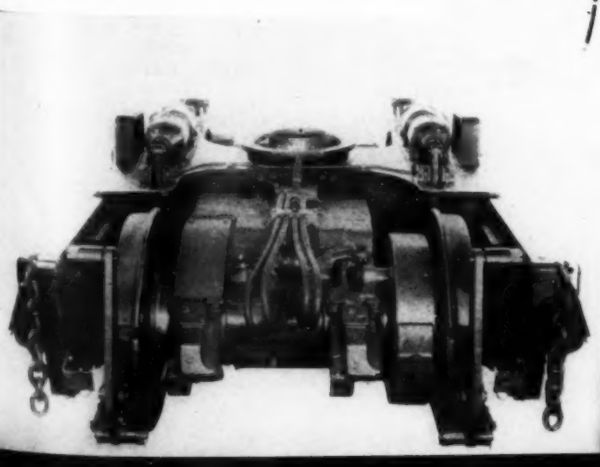
Alco-G.E. 4000 hp. double-end Diesel-electric road locomotive; G.E. 3600 hp. electric locomotive; and Alco steam locomotive side by side.





Truck for G.E. Diesel-electric 132-ton, 1000 hp. locomotive.





G.E. d.c. traction generator-exciter set consisting of main and auxiliary generators and exciter.

provided to decrease the generator voltage as the demand for current rises and, conversely, to keep the product of volts and amperes including generator losses at a constant kilowatt value over the operating range within the constant horsepower input of the engine.

The volt-ampere characteristic of the generator, therefore, conforms to a curve determined by the available engine horsepower for traction. The maximum current limit on this curve, established by the motor demand, is approximately 30% adhesion. The voltage limit is determined by the motor's demand to obtain the maximum locomotive speed desired for full engine horsepower utilization. The generator design must be such as to have commutation ability to handle the maximum current and to produce the required voltage before it is limited by saturation of the steel. The means for obtaining this generator characteristic are many. A scheme now in common use is to control the excitation of the generator shunt field through a split-pole differential exciter, the special feature of which is the winding and construction of the exciting pole. Each pole has two parts, commonly referred to as the differential and shunt sections. The shunt winding embraces both sections. The differential section has, in addition, a series winding, the polarity of which is such as to oppose that of the shunt winding, and is connected in series with the generator load current.

The peculiar reverse-curve characteristic of the exciter is obtained mainly by careful attention to saturation shapes of these split pole sections. At maximum generator voltage and minimum current both sections are excited by the shunt winding and are well up on the saturation curve to give maximum exciter volts. As the differential winding becomes effective with rise in load current, its contribution to the total flux is reduced along its saturation curve down to zero and produces the first bend in the curve. The exciter then works on the shunt section alone.

Further increase in load current reverses the polarity of the differential section and opposes the effect of the shunt section, at a value again determined by its saturation shape, to produce the second and reverse bend in the curve.

To obtain the proper characteristic shape involves design proportioning of the component parts, a consideration of saturation, armature reaction, resistance drop, and the activity of the electrical circuits.

The traction generator is a multi-polar design with the armature coupled directly to the Diesel engine crankshaft. A series field wound on each pole in addition to the shunt winding is connected in series with the generator armature to serve as a series motor to crank the engine up to the firing speed. Power for this purpose is supplied by a storage battery, which is disconnected after the engine begins to function.

The generator, as in the case of motors, must be ventilated to aid in the dissipation of heat. A fan mounted on the engine end of the armature draws air in two parallel paths, one under the commutator and through the ventilating ducts in the core, and the other through the air gap and around by the field coils to join with the armature air at the fan where it is discharged.

The mechanical construction must withstand the instantaneous torque impulses following each cylinder explosion and must be further matched with its engine to avoid serious critical speeds and resultant torsional vibratory stresses within the operating range.

A pulley is generally mounted on the end of the shaft extension for driving auxiliary equipment, such as the split pole exciter, battery-charging generator and traction-motor blowers.

The control of the locomotive ranks equally in importance with the motors and generators. The control must provide means to regulate the power of the locomotive at will to move a train ahead or in reverse, to coordinate the output of several power plants, and by means of multiple-unit control to cause several locomotive units to act as a single engine from one control station.

The output of each engine is controlled by making selection of speed on the engine governor, which then regulates the fuel supply to maintain the selected speed. The governor is regulated through a mechanism actuated by combination action of three air-actuated pistons to give eight positions. The compressed air to the cylinders is controlled by magnet

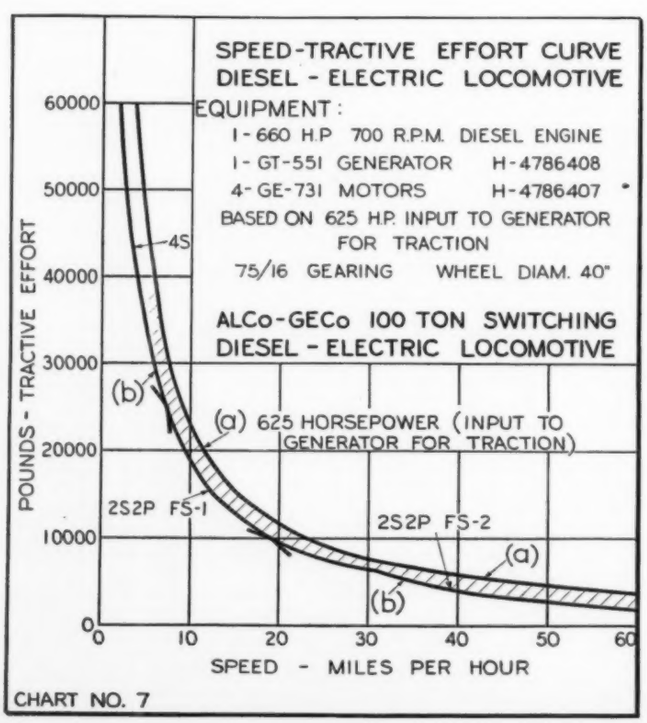


CHART NO. 7

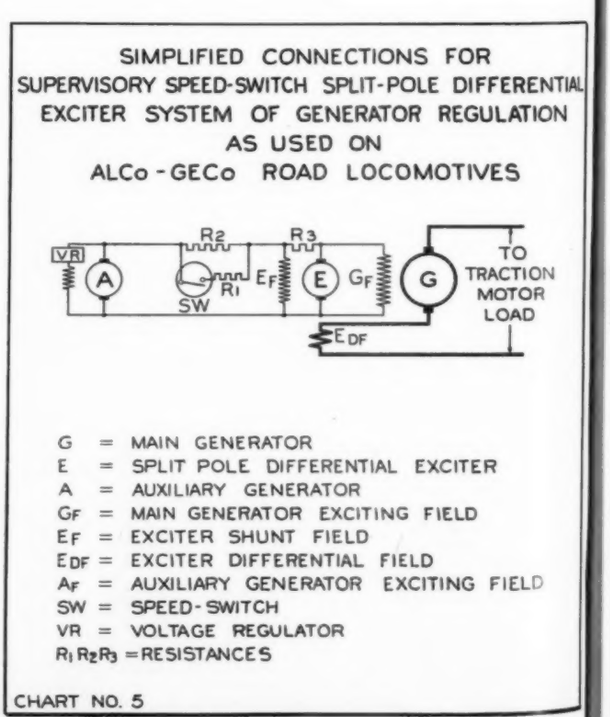


CHART NO. 5

valves energized by the desired selection of the controller position. Any number of engines may thus be controlled from one station.

The reverser is a drum which carries contacts made to move under fingers connected to the main power circuit of the motors and generators. It is actuated by an air cylinder, controlled by a magnet valve, energized by the desired selection of direction at the controller station. In this manner, any number of units may be controlled at will.

The control functions to make connection between motors and generators. To furnish maximum tractive effort, the motors are first connected in series across the generator. This permits use of a generator having a maximum current capacity necessary to slip the wheels of one traction motor. By connecting two or four such motors in series and passing the same current through all, the tractive effort of the locomotive may be doubled or quadrupled without additional generator current.

The locomotive operates in the series connection until the speed is raised to a point where the current drops to approximately one-half of the maximum value. The control then changes to the parallel connection of motors, so that the generator current is again at maximum value. Acceleration of the train continues with the generator voltage now impressed directly on each motor instead of being divided between them. The series-parallel connection permits the use of a smaller generator.

These connections are made through the operation of contactors actuated by air pistons and controlled by magnet valves in correct sequence, insured by means of electrical interlocks.

The transfer from series to parallel is obtained automatically by a motor transfer and field shunt relay. This relay has a spring-loaded armature that is acted upon by two opposed voltage and current coils. When the voltage of the generator reaches a predetermined value, so that the voltage coil overpowers the combined action of spring and current coil, the relay picks up and initiates the transfer from series to parallel by closing a control relay which holds the parallel connection.

The motor transfer relay operates again when acceleration has progressed to a speed sufficient to drop the current again and close the motor-field shunt circuit. The reduction of motor field strength causes another increase in motor current and hence generator current to effect further acceleration at full horsepower until the knee of the generator characteristic curve is reached, after which the power input to the train falls off with further increase in train speed.

The locomotive battery is charged by an auxiliary generator driven by the engine. The voltage regulator automatically maintains constant voltage over the variable engine speed range by controlling the steps in a variable resistance connected in series with the auxiliary-generator field circuit.

The speed switch is part of a supervisory control scheme to permit loading of the engine up to its full power. It prevents stalling of the engine when its power falls off because of altitude or faulty engine operation. The switch is a rotary speed-sensitive device, mounted on the end of the split pole exciter shaft which is belt-driven by the engine. When the engine operates at full horsepower and speed, the speed switch mechanism is adjusted to make and break a contact once each revolution. This action is obtained when the centrifugal force of a weight working against a spring balances that of the spring, so that gravity makes and breaks the contact as the weight rotates. The contact alternately cuts a section of resistance in and out of the excitation circuit of the exciter, the average value of which is such as to hold the generator demand at normal horsepower.

If the engine loses power for any reason it tends to stall and lose speed. This causes the contacts to remain open a greater portion of time, so that average value of the circuit resistance is increased. This unloads the engine until it can just handle the load.

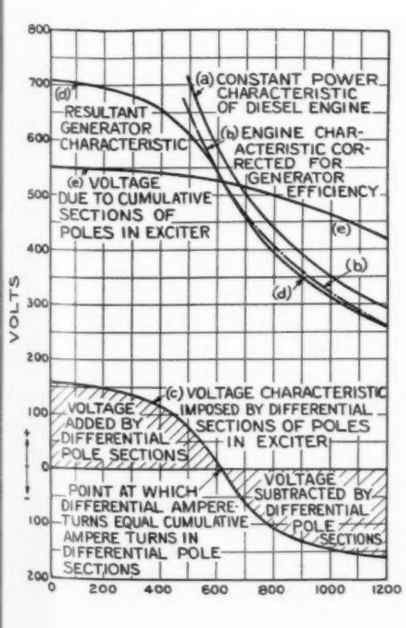
When the engine has more power or the generator is heated beyond average value, the engine would tend to overspeed. In this case the contacts would close and reduce the average circuit resistance, and cause the generator to demand more load.

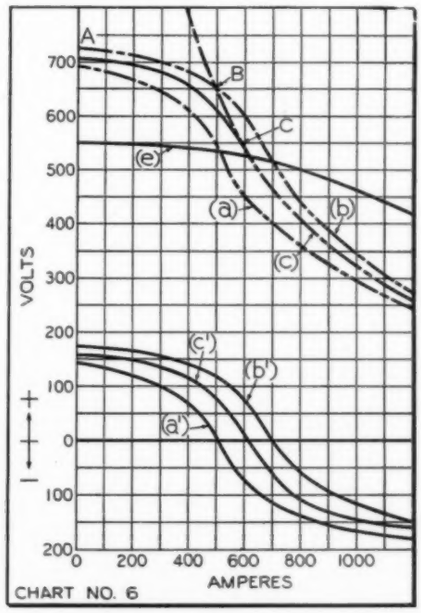
This device installed on each power plant is a constant supervisor, automatically insuring the useful utilization of all available engine horsepower under varying conditions of operation and repair.

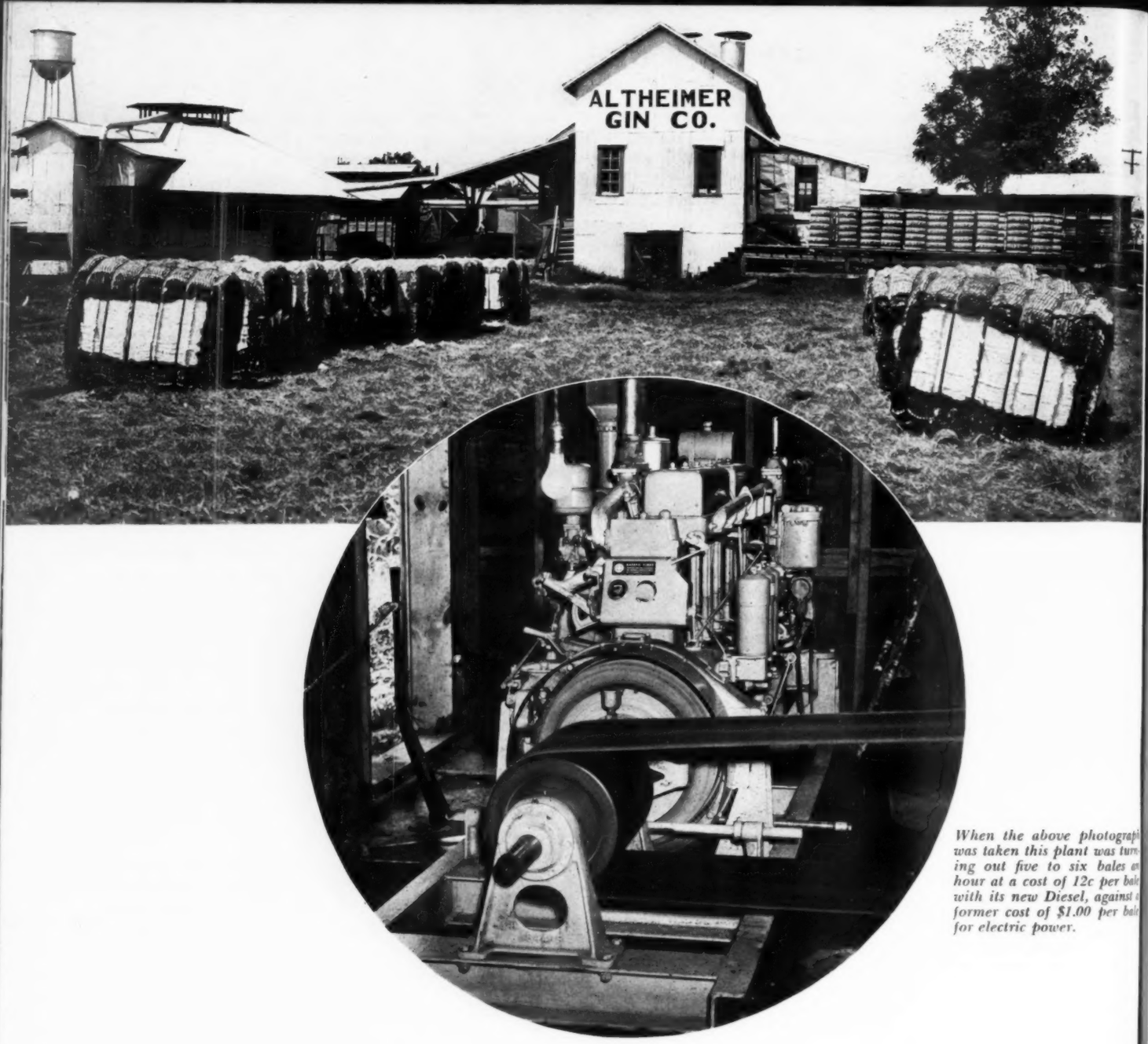
The electric transmission provides for the Diesel locomotive many of the advantages possessed by the straight electric locomotive, and makes it essentially an electric locomotive that carries its own power plant.

The electric transmission, by virtue of the motors acting as generators, makes electric braking of trains on mountain grades attractive and possible, an advantage formerly confined only to the straight electric locomotive.

The Diesel-electric locomotive has reached such a position that operators must give consideration to its abilities. It has attained full recognition in the field of motive power, and no railroad family portrait is complete unless the Diesel-electric locomotive is photographed side by side with its time-honored steam father and powerful straight-electric brother.


VOLTS
(a) CONSTANT POWER CHARACTERISTIC OF DIESEL ENGINE
(d) RESULTANT GENERATOR CHARACTERISTIC
(b) ENGINE CHARACTERISTIC CORRECTED FOR GENERATOR EFFICIENCY
(e) VOLTAGE DUE TO CUMULATIVE SECTIONS OF POLES IN EXCITER
(c) VOLTAGE CHARACTERISTIC IMPOSED BY DIFFERENTIAL SECTIONS OF POLES IN EXCITER
VOLTAGE ADDED BY DIFFERENTIAL POLE SECTIONS
VOLTAGE SUBTRACTED BY DIFFERENTIAL POLE SECTIONS
POINT AT WHICH DIFFERENTIAL AMPERE-TURNS EQUAL CUMULATIVE AMPERE TURNS IN DIFFERENTIAL POLE SECTIONS





When the above photograph was taken this plant was turning out five to six bales an hour at a cost of 12c per bale with its new Diesel, against a former cost of $1.00 per bale for electric power.

GINNING COTTON FOR 12c A BALE

THE Altheimer Gin Company, located at Altheimer, Arkansas, has installed a Caterpillar Diesel engine to drive its five 80-saw stand Continental gin with full equipment. The installation was made in August, 1941. As shown here, the unit is designated as the Caterpillar D13000 cotton gin Diesel, mounted on a steel channel base for portability, clutch and shaft extension with outboard bearing to carry the belt pulley and heat exchanger. This is a six cylinder full Diesel, 5¾" bore by 8" stroke, rated 115 hp. at 900 rpm., with full equipment and for continuous service. It is seen that the unit is especially adapted to cotton gin service, which accounts for the excellent job it is doing for the Altheimer Gin Company.

Average output of the stands is five to six bales of cotton per hour, according to Robert Bowen, Gin manager. Operating conditions are dusty, and the weather usually hot and dry. The engine is pulling the five-stand gin with ease. Formerly, a 150 hp. electric motor was used at a cost of about one dollar per bale for electricity. Cost per bale with the Diesel engine is approximately twelve cents.

The twenty-year-old Hearne, Texas, power plant presents this modern appearance after recent remodeling.

A TWENTY-YEAR SUCCESS STORY

By A. V. REITER

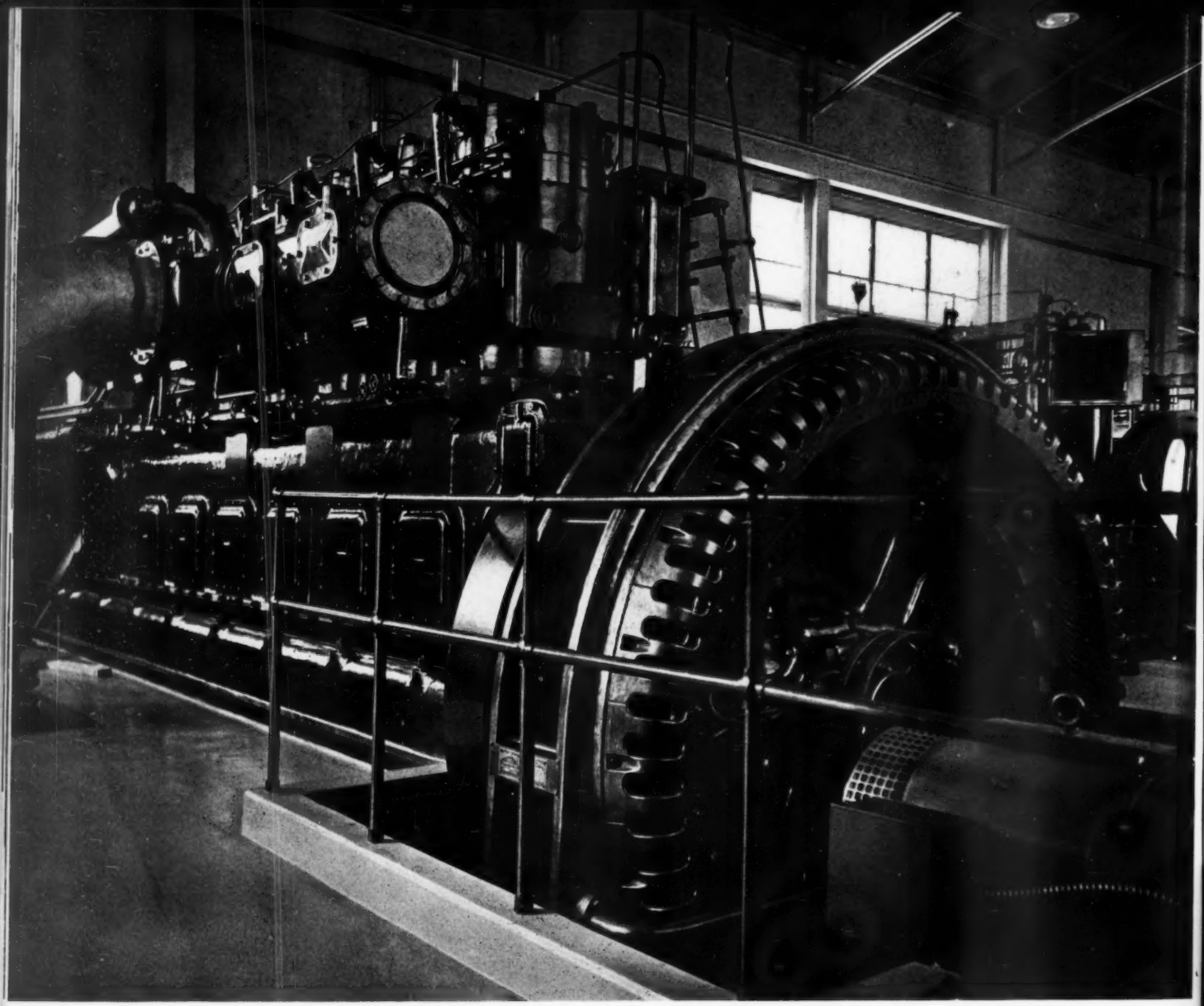
ON the twentieth anniversary of the installation of its municipal light and power plant, the City of Hearne set aside the day of November 11, 1941, to dedicate the city buildings and projects which have been built with the profits earned by one of the most successful home-owned utilities in Texas.

Today this outstanding municipal light plant is furnishing electric energy for the present emergency. Being a self-sustaining plant, it assures the citizens of Hearne and its factories a supply of electric energy not dependent on highline power transmitted over long distances. Thus, Hearne can furnish its own power and electricity, and let other sources go to vital industries near the huge steam generating plants.

A glance at the history of the plant shows a record of steady increase in earnings as the demand for more power was met with the enlargement of generating facilities. Beginning in 1911 with a single steam engine, the municipal plant has grown to five Diesel generating units having a total capacity of 1842 kw. with assets of nearly half a million dollars, and an annual profit of over $30,000.

A turning point came in 1928 after home consumption and industry had been turning more and more to the use of electricity. At this time the city administration saw the necessity of enlarging the plant, and the advisability of using Diesels. That year the steam equipment was replaced by three Fairbanks-Morse 180 hp. Diesel engines. The following year a 420 hp. Fairbanks-Morse unit was added, and in 1940, the power plant building was remodeled to house its largest unit, a 1000 hp. Fairbanks-Morse Diesel. Today the city has 964 electrical connections, 739 water meters, and 502 sewer connections.

Since its inception, one man has been connected with the planning and development of civic advancement through municipal ownership, and to him much credit is due for its success. That man is Mr. W. A. Wilkerson, City Manager of Hearne, who says; "We are vain enough to think that with our revamped plant, we have something worth showing to the municipal plant world. . . . Our park and its buildings were entirely financed by earnings of our plants; no bonds, no assessments.



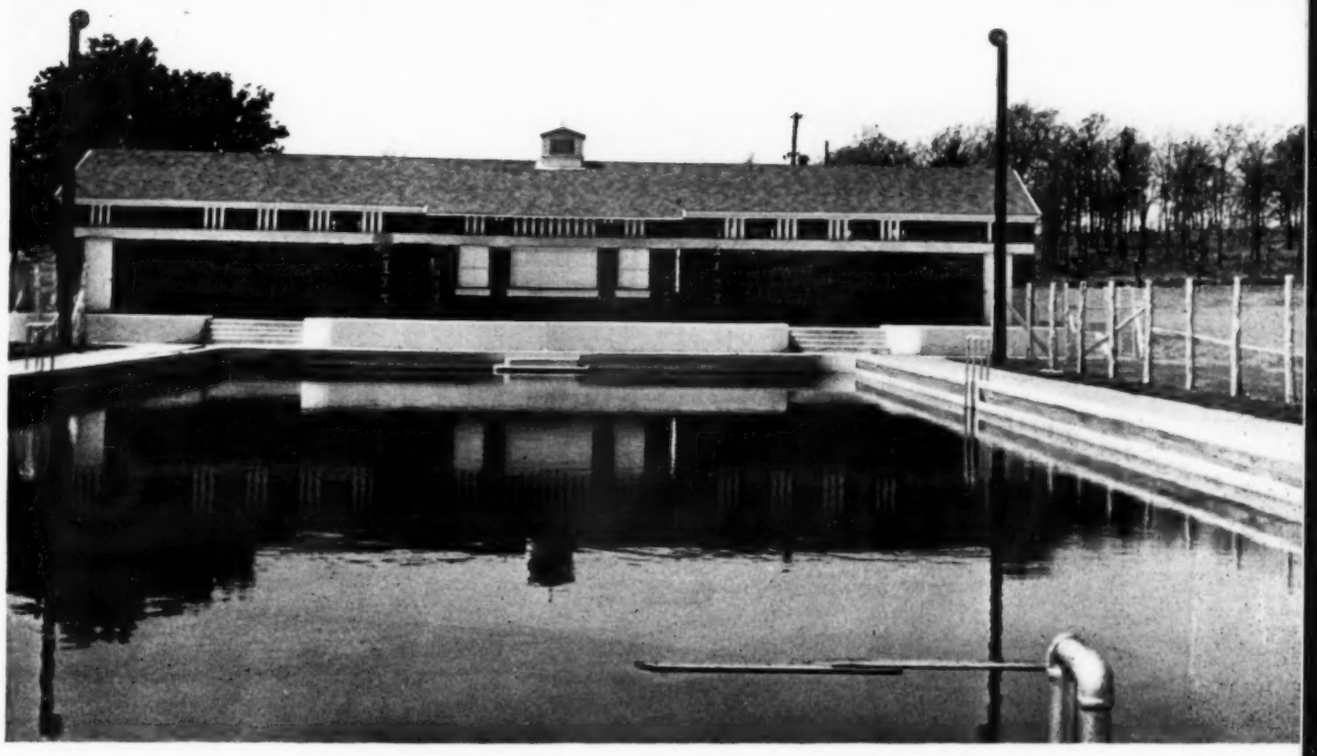
Largest and newest Diesel in the Hearne, Texas, municipal plant, a Fairbanks-Morse 16" x 20" Diesel of 1000 hp. at 277 rpm.

no debts. The project embraces a ninety-acre park with swimming pool, golf course, civic center club house, children's playground, eight picnic sites with stone tables and barbeque ovens at each, and a sunken garden. This is good data to use on the 'Doubting Thomases' against the argument that municipal plants cannot be made to pay."

And on dedication day another building was added to the list of those made possible by the profits from the light plant. This is the new city hall adjacent to the plant building.

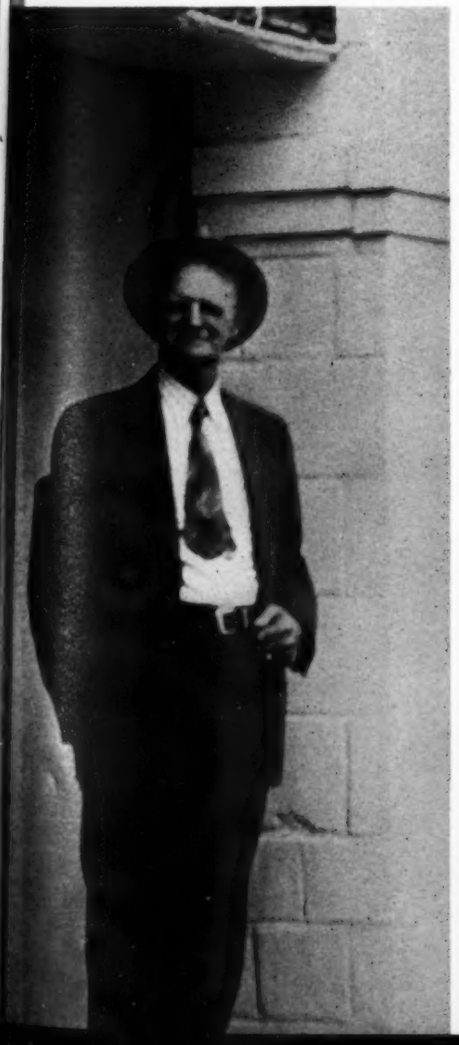
One of Hearne's new buildings, the Civic Center Building, erected with power plant profits.

W. A. Hearne, "Home-O



Another source of pride and satisfaction at Hearne, the Civic Center Swimming Pool, built with municipal utility profits without any tax assessments.

W. A. Wilkerson, City Manager of Hearne, Texas, who has fostered the "Home-Owned" utilities for twenty years.



Built of native rock, following preliminary plans drawn by Mr. Wilkerson, and set amidst pecan trees, it is acclaimed as one of the city's most beautiful buildings.

Considering that the population of Hearne is 3,511, one quite naturally would consult the record to see just how such an extensive program of civic building is financially possible.

All right, let's look at the record. The last twelve months' summary of the municipal light plant will give us some idea of what has been going on this past decade in the business affairs of the plant; gross receipts from the sale of electrical energy, $48,462.61; expenses, including power plant production, distribution, and office costs, $23,186.44; annual gross profit, $25,276.17.

Yet one would not get the complete story without knowing that the power plant donates electrical energy for civic use. Thus it is that Hearne is known as "The City of Bright Lights and the Sparkling Artesian Water."

The 2000 bright awning lights which are placed eighteen inches apart along the business district are one form of the many bonuses given the citizens for their cooperation in the business of home ownership. Recent figures for twelve month operation are: street and awning lights, $5,046.13; lamp replacements, $75.14; city schools, $902.52; total free electric service to the City of Hearne, $6,041.79.

In addition to the electrical service donated to the community, and the beautifully planned municipal buildings financed from the profits of the plant, Hearne offers its citizens electric rates that are as low or lower than those of surrounding communities.

The physical appearance of the plant sets the pace in order, cleanliness, and efficient management. The floor is the marine grey-green such as one finds only in Texas gulf waters. The five engines are high-lighted with olive-green matched by a dado band of the same shade, which is window and engine high. The exhaust pipes are silver, painted to echo the gleaming tones of the structural work and girders overhead.

The plant equipment consists of Diesel engines, alternators, and exciters by Fairbanks, Morse & Co.; voltage regulators by Allis-Chalmers; Woodward I.C. governors; switch gear by General Electric. Air filters are Vortox and American; Humble lube oil is reclaimed by a Hilco machine; fuel filters are Nugent; piston cooling oil is cooled by a Ross shell and tube heat exchanger; exhaust pyrometer on the new Diesel is an Alnor.

MOVING DIRT THE DIESEL WAY: FAST—AT LOW COST

By JIM MEDFORD

To move ground in the shortest possible time, you must have equipment that bites and digests Gullivarian mouthfuls like a clock ticks, and Jim Taylor's got it. He's part, a big part, of the contracting firm of Dimmitt & Taylor, Los Angeles, that is clearing and grading acres where the new West Coast steel mill of the Iron and Steel Division, Kaiser Company, Inc., is going in among the poultry yards and orange groves near Fontana, California.

There's a lot of earth, about 1,000,000 cubic yards, to be taken from one place and put in another, and with material to be run in and railroad spurs and sidings to be built to handle it, everyone is after Jim to keep things rolling along like Ol' Man River. And that's the way things are moving. They've got to get that huge structure erected so it can begin producing the steel now so urgently needed. But right now the dust of the earth is mighty important, and there's plenty of it circulating where Jim's four 16-yard, struck measure, Oshkosh Earth Movers are picking it up here and putting it down there behind their six cylinder, 174 horsepower Hercules Diesels that pull these giant open belly sloths along at a speed that makes possible six 1 3/10 mile trips every sixty minutes at an hourly fuel cost of only 27½ cents—five gallons of Diesel oil at 5½ cents per unit. And to keep 'em moving, a D8 Caterpillar pusher is tied on their tail where the going is tough.

They got to keep moving dirt—it's a $50,000,000 job being done the Diesel way!

Left: A huge Oshkosh Earth Mover with 174 hp. Hercules Diesel engined tractor going in for the first cut. Below: The Earth Mover taking a big bite with a Caterpillar Diesel pusher helping out.

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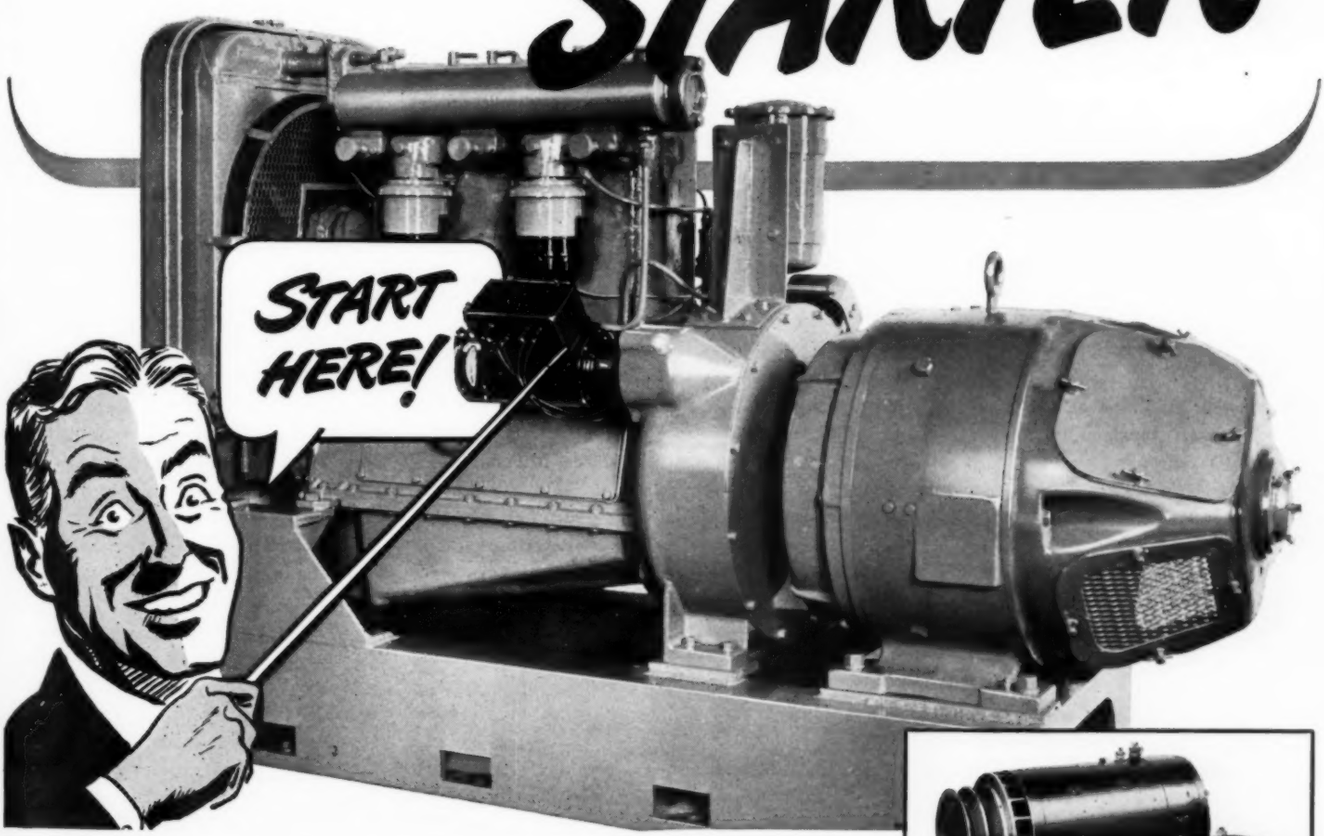

AUTO-LITE'S revolutionary new starter for Diesels meshes on reduced voltage, cranks on full. This two-step operation is typical of the improved design—there is power and to spare to overcome the high torsional load which is a function of Diesel starting. Quieter, more efficient, the two-step principle also greatly reduces possibility of damage to housing, pinion or ring gear.

Auto-Lite Starting and Generating systems for Diesels are designed and built by the World's largest independent manufacturer of automotive electrical equipment. For prices and complete details, write to

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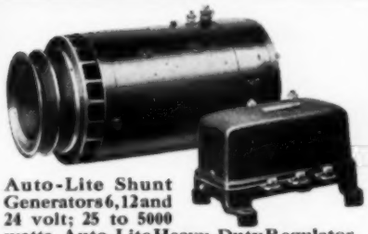

Auto-Lite Shunt Generators 6, 12 and 24 volt; 25 to 5000 watts. Auto-Lite Heavy-Duty Regulator has 3 units—voltage, current and cut-out relay—in one water and dust-proof assembly, maintains voltage to plus or minus 2%—integrally radio suppressed.

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FACTORS GOVERNING THE COST OF DIESEL GENERATED POWER

By R. L. GREGORY*

ALL engineers handling power plants are interested in production costs. You have often heard the question, when the subject of power plant costs has arisen, "What should it cost to produce power with Diesel units?" To give a specific answer to this question is impossible.

In your own particular plant, you can arrive at the actual cost of production by means of the records you keep, but to answer the question as applied to Diesel plants in general, there are so many factors which must be taken into consideration, all of which vary with each individual plant, that the question in general cannot be answered.

On the other hand, if you want to check up on your own costs you must be familiar with all these factors in order that you may be able to arrive at an accurate conclusion. It will be the object of these articles, to discuss these factors in general.

The major item of expense in operating a Diesel plant for power production is the fuel cost. This cost depends upon:

a. Type of fuel; b. Location of your plant with relation to the source of fuel supply; c. Your fuel handling equipment; d. Type of power load and unit load factor.

There are many types of fuel suitable for use in Diesel operation. The fuel which will give you the most satisfactory results depends upon the design of the units you are operating. Some units are designed by the manufacturer to give economic results on cheaper and lower gravity fuels, while others are designed primarily to use the higher gravity fuels. In determining the type of fuel you should use, it is best to consult the manufacturer as to what specifications he advises in the fuel to use in your engine. His recommendations should be adhered to in the matter, since all manufacturers test out different fuels and should know from these tests what fuels give the best results.

An engineer with initiative may try several fuels which adhere to these specifications, but it is poor practice to use cheap grades of fuel when better grades are specified, because you will usually find that after a period of operation, the money saved in buying cheap fuel will be spent twofold in maintenance and repairs, thus showing false economy.

Location of your plant with relation to the source of fuel supply must also be given consideration. Long transportation distances mean higher transportation charges which increase fuel costs. It is up to the engineer to use his judgment in the matter as to whether a medium grade of fuel, meeting the specifications required with a closer source of supply, would justify its use in less transportation charge over a higher grade of fuel which might give better economy, hauled over a greater distance. In other words, he might be justified in sacrificing some degree of economy in order to save on fuel costs. This point would have to be determined by a cut-and-try method.

In conjunction with determining this point, you must take into consideration your fuel handling equipment. Fuels which can be used without excessive straining, centrifuging, and handling to eliminate foreign matter might prove cheaper in the long run, since the more fuel handling equipment required, the more maintenance required of that equipment.

The type of load and load factor play an important part in fuel costs. If the load is steady and you can operate at a good load factor, the fuel required to produce an output of kilowatt hours will be considerably less than where you have a heavy swinging load with a lower load factor. What then is considered a good load factor on a Diesel unit? Any Diesel unit which operates at a load factor of 75 percent or better can produce a kilowatt hour on approximately 60 percent of the fuel, which would be necessary to produce a kilowatt hour on a unit operating at 30 to 40 percent load factor. That, of course, is provided the mechanical condition of your unit was the same in both instances.

If you want to check this point on a unit of your own, try operating it at different load factors from say 25 percent to 85 percent or even 100 percent. Operate the unit at varying load factors for a period of time and check your fuel consumption against your kilowatt output. Then construct a graph showing your economy at the various load factors. When you have the curve plotted, you will note that as the load factor increases, the kilowatt hour output increases until you reach approximately 80 per cent. From this point on the curve will have a tendency to flatten out.

In plants operating several units in parallel, many engineers like to carry a good load factor on all units save one. Then they allow this last unit to carry the swings. Of course, this again depends upon the type of load. If the swings are normal and not erratic, each unit can take its share of the load. But whatever method you adopt, it will be found advantageous to maintain as high a load factor on your units as cooling facilities and other conditions will permit, if you desire to keep fuel costs at a minimum, by getting the most economy out of whatever fuel you use.

In summarizing fuel costs, all the above mentioned conditions must be taken into consideration, along with the fact that your units should be kept in good mechanical condition.

The cost of labor to operate the plant, depends on several factors, as does the fuel costs, and are as follows: a. availability of competent attendants; b. prevailing local wage; c. size of plant and amount of equipment; d. inspection and maintenance procedure; e. type of load and

. . . *And now please turn to page 71* . . .

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* *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*

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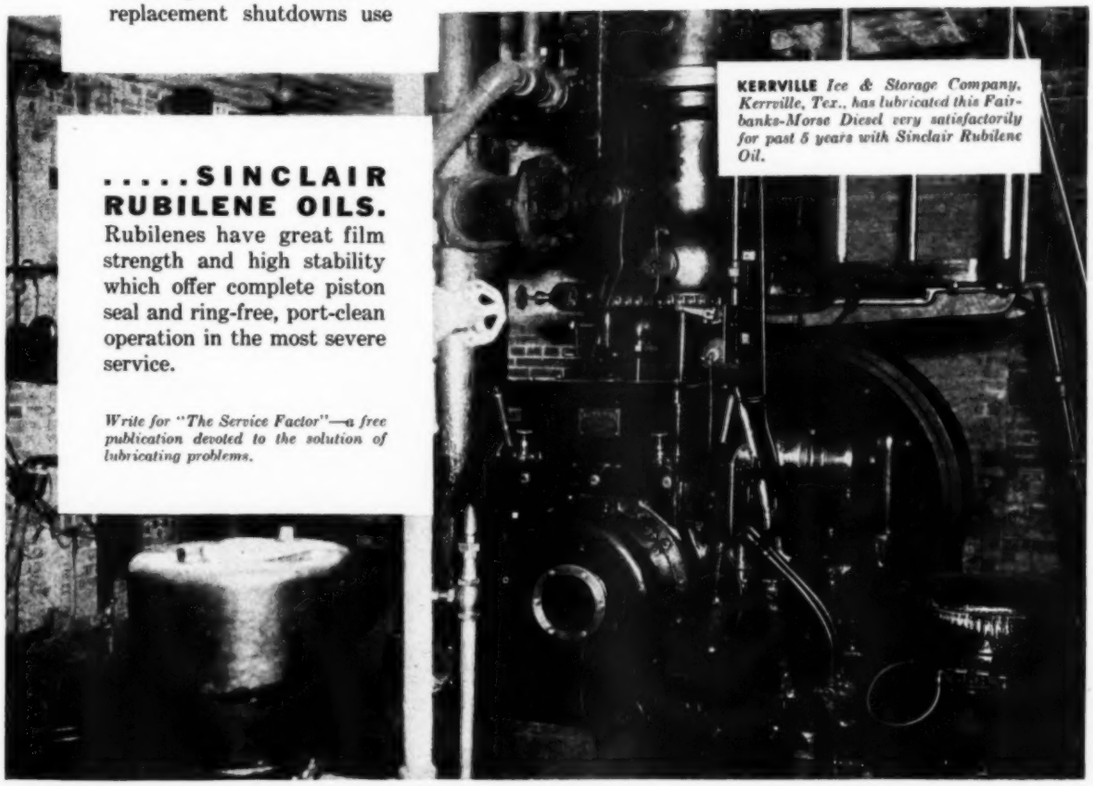

KERRVILLE *Ice & Storage Company, Kerrville, Tex., has lubricated this Fairbanks-Morse Diesel very satisfactorily for past 5 years with Sinclair Rubilene Oil.*

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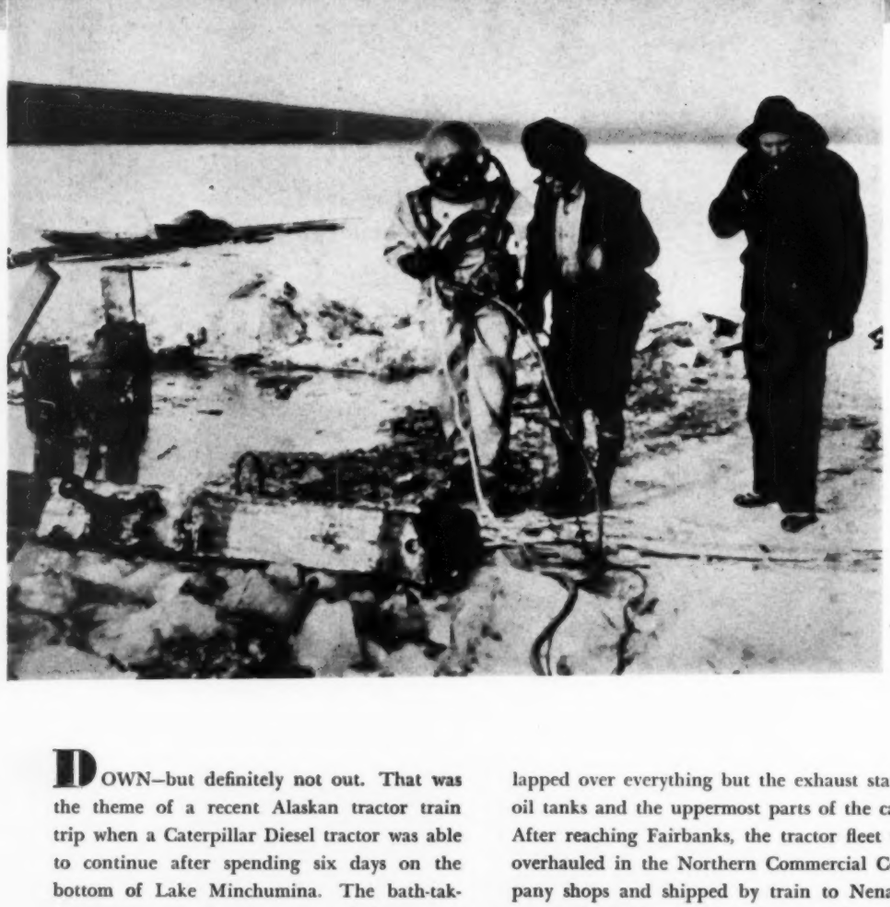


Caterpillar Diesel tractor and train of sleds loaded with building materials, pushing the tractor that had an icy bath in Lake Minchumina, Alaska.

The diver is going down to attach cables to Caterpillar Diesel tractor and freight that fell through ice. Temperature—twenty-five below!

A SHORT COLD DIESEL STORY

DOWN—but definitely not out. That was the theme of a recent Alaskan tractor train trip when a Caterpillar Diesel tractor was able to continue after spending six days on the bottom of Lake Minchumina. The bath-taking tractor was one of a train of three, each pulling three sleds with from twenty to twenty-five tons of freight for the Civil Aeronautics Administration project at Lake Minchumina.

Last fall these tractors, owned by Morrison-Knudsen Company, startled Alaska by advancing overland from Northway, where a CAA project had been completed, to Fairbanks, breaking their own trail through a trackless wilderness. Their feats of might included the wading of the Tanana River which lapped over everything but the exhaust stacks, oil tanks and the uppermost parts of the cabs. After reaching Fairbanks, the tractor fleet was overhauled in the Northern Commercial Company shops and shipped by train to Nenana. It was from Nenana that the train launched its hauling trips to the CAA project.

During one of these jaunts, there was a fresh snowfall on Lake Minchumina, a thaw, and an overflow. In addition to the weight of the freight trains, there was the weight of water. The first tractor suddenly broke through and sank to the bottom with the operator suffering nothing worse than an icy ducking. The three sleds, attached to the machine with a long tow cable, did not break through the ice until an hour later. Other sections of the train took a circular route and reached shore safely. Tripod, pulleys, ramps, and other apparatus were rigged up. A diving suit, carried for just such an emergency, was brought into use, and in temperatures ranging from 10 to 25 degrees below zero, divers attached cables to the tractor and heavy freight. It took six days, in all, to recover the freight and the tractor.

The huge tractor came up on long timbers resting on cross braces at the upper end, frozen into the ice. Resting on long timbers to distribute the weight, the machine was then towed to shore. It was pushed into camp, drained and cleaned, and required no parts, except gaskets, to put it in running condition.

. . . . *Continued from page 68* . . . .

distribution system; f. miscellaneous.

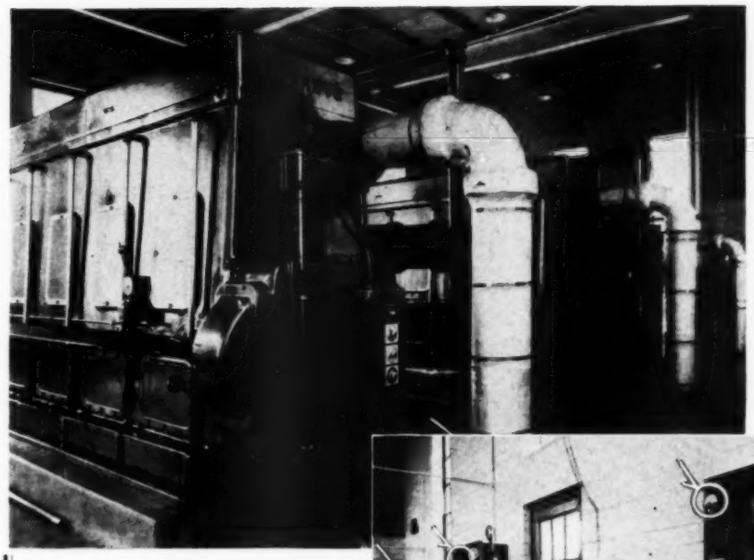
The Diesel as a prime mover for power plant operation is comparatively new, when compared to the use of steam and hydro prime movers. Its growth in this field has been very rapid in the past decade; consequently, men with knowledge of Diesel construction and operation are not as plentiful as men connected with other and older types of prime movers. In many of the smaller communities which have recently gone to Diesel operation, local men with knowledge of Diesel operation were not available. In order to obtain competent men, they had to be brought in from other territories and higher wages had to be paid to secure them.

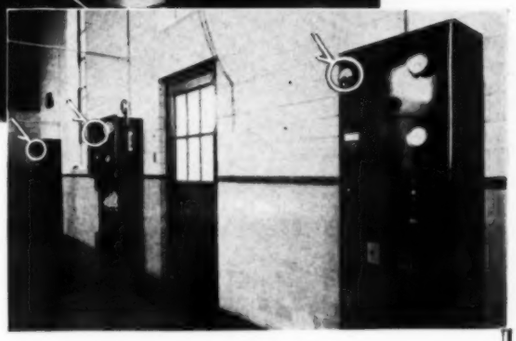
Wages vary in different localities, reverting back to the law of supply and demand, the cost of living, etc. So there is no fixed wage and salaries for Diesel attendants in general.

The size of the plant and the amount of equipment to be looked after determine the number of attendants required and the amount of man hours necessary to operate the plant can only be determined after the shifts are organized and operating schedules worked out.

Inspection and maintenance schedules play an important part in production costs. If the plant has plenty of reserve capacity to allow for units having an outage period during regular working hours, the maintenance and inspection costs can be kept at a minimum. On the other hand, if it is necessary to do inspection and maintenance work on Sundays or during the lighter load periods, costs usually mount over those which are incurred during the regular operating day. This is true in the smaller plants where the maintenance is carried on by the operating force, and a regular maintenance crew is not a part of the plant personnel. It is up to those in charge to keep these costs at a minimum by having a predetermined schedule for this work.

In order to follow such a schedule, the type of load must be taken into consideration. Those in charge of this work must determine when load conditions are most favorable for inspection and maintenance work, and arrange their schedule to conform with those periods. The distribution system plays an important part in this phase. A well constructed distribution system eliminates breakdowns and failures which often occur in distribution systems which we





The three Buckeye Diesels, totalling 975 h.p. in the Grayling, Michigan, municipal power plant, each engine protected by its own individual "Alnor" pyrometer, shown right.

"ALNOR" insures top Diesel efficiency

The installation of a Diesel generating plant at Grayling, Michigan, has resulted in a 20% cut in electric rates and a two mill tax reduction within two years. To accomplish these benefits required continuous availability of all three Diesels at best efficiency. Regular and frequent indication of individual cylinder performance by use of "Alnor" exhaust pyrometers insures maximum efficiency, spots trouble in the making, and prevents enforced shutdowns.

●

Buy or specify "Alnor"
Ask for catalog

Illinois Testing Laboratories Inc.
Good Gauges Know!
423 NORTH LaSALLE STREET, CHICAGO, ILLINOIS
MANUFACTURERS OF "ALNOR" AND PRICE INSTRUMENTS • PRODUCTS OF 42 YEARS' EXPERIENCE

Illustrated is an interesting use of two heavy duty Model E Twin Disc Clutches in a shell working machine.

THE FIELD . . . THE "SUPREME COURT" OF TESTING LABORATORIES

Although Twin Disc heavy duty clutches were tested under the most rigid conditions in our factory laboratories, it was not until ample field-tests had confirmed our findings that these clutches were released for oil field use.

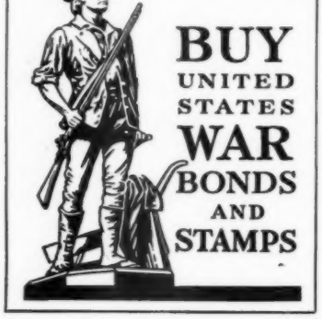
In drilling rigs—in switching locomotives — in power shovels and other types of heavy duty equipment, the Model E and Model C Twin Disc Clutches have stood up under the most severe service. Being fully enclosed, they are particularly well suited to outdoor installations; and their demonstrated long work-life, reliable performance and easy one-point adjustment make them the first choice of both the manufacturer and the user.

TWIN DISC CLUTCH COMPANY • RACINE, WISCONSIN

so often note as sloppily and poorly constructed. A good distribution system can be maintained with a minimum of labor which cost must be taken into consideration when figuring production costs.

Many plants use the plant personnel for miscellaneous duties; such as, maintaining plant buildings, grounds, and work of a nature outside of production of actual power. The amount of such work must be taken into consideration in figuring production costs even though the work has no direct bearing on the power production.

Further factors to be taken into consideration on production costs will be given in our next article.



New Bulletin On Fuel Oil Treatment

"BURNING Fuel Oil" is the title of a new twenty-eight page booklet, a limited number of which are available without charge. Although this booklet was intended for engineers in charge of external combustion oil-fired plants, the greater part of the discussion applies to Diesel engine operation. Diesel engineers will be especially interested in numerous problems connected with burning fuel oil and also their solutions. Chapters include the chemical treatment of fuel oil to counteract contamination; free-flowing oil supply; uniform atomization; promotes combustion by catalysis; quicker starting, smoother performance and cleaner exhaust; preserving equipment and conserving fuel oil. Write for your copy to Combustion Service Co., 1451 Broadway, New York, N. Y.

Allis-Chalmers Issues New Handbook for Wartime Care of V-Belts

WHEREAS the average maintenance book of the past has assumed the reader's familiarity with its subject, this is not a safe assumption today. Thousands and thousands of workers in

war industries — many of them women — have made maintenance training a new problem.

To help solve it, Allis-Chalmers has just published a new handbook—"Plain Facts on War-time Care of Rubber V-belts"—which aims to make complete sense of the entire V-belt maintenance story.

It begins with the anatomy of a V-belt and principle of the V-belt drive—and ends with post-mortems on actual damaged V-belts. How the anatomy of a V-belt affects its maintenance, how to obtain proper V-belt tension, what to do about worn sheaves, what determines the life-expectancy of V-belts—these are some of the plain facts revealed in the new handbook.

This new book applies to all makes of V-belts, contains no advertising, and is available without charge on request to Allis-Chalmers, Milwaukee, Wisconsin.

C. R. Clingman Joins Honan-Crane Corp.

C. R. CLINGMAN has recently joined the sales force of the Honan-Crane Corp., of Lebanon, Indiana, manufacturers of Oil Purification Equipment. He will be in charge of the New Orleans area and his office is located at 631 Maison–Blanche Building, New Orleans, Louisiana. Clingman has been with the Gulf Oil Corp. for the past eight years and previous to that time has had many years of experience as a Mechanical and Industrial Plant Engineer.

New Dy-Namic Balancers Introduced by Bear to Meet War Production Needs

WAR PRODUCTION is hastening the adoption of Dy-Namic Balancing to eliminate the noise and premature wear of shafts, bearings, etc., resulting from the excessive vibrations of rotating parts caused by couple action. The

INSURE ENGINE PERFORMANCE

Model 19800 MICHIANA Lube Oil Filter (653H.P.) has four standard filter elements. Other sizes have one, three, six, seven and 10 elements.

Filtering element —can be either the Re-Packable type or Throw-away Replaceable type. Used in all Filters from 163 to 1633 H.P. capacity.

Value of MICHIANA Principle of O.I Filtering Well Established

To be sure of clean oil, properly engineered and designed Filters of adequate capacity for the engines are now available. Through long years of Filter manufacturing, through close cooperation with engine builders,—through the experience gained in actual application of tens of thousands of Filters, MICHIANA offers a practical solution, — a line of Filters to meet the exacting demands of today.

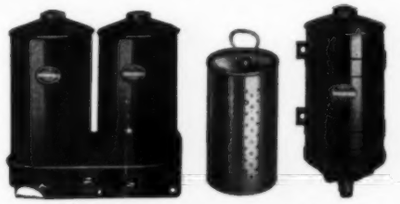
The practical value and the dependability of the MICHIANA principle of oil filtering have been well established. MICHIANA Filters have been given high rank by prominent engineers and by operators of engines used on streamline trains and switch engines,—on trucks, tractors and construction machinery,—on tankers, tenders, destroyers, speed boats, tugs, towboats, barges and all types of Naval and Marchant Marine vessels.

Filter Elements Interchangeable

Single Filters are made in capacities up to 1633 H.P. and may be used in groups for various other capacities. *All filter elements* used in filters from 163 to 1633 H.P. are alike, being used singly or in sets of three, four, six, seven and ten according to capacity. Where Filters of different capacities are used the stocking of spare elements is thus simplified.

Elements are available in either the Re-packable Type for lowest possible maintenance cost,—or the Replaceable or Cartridge-in-a-can Type for quick servicing. With this type the used cartridge is removed and another placed over the center tube of the filter.

For full power,—for lube oil conservation,—for better all-round performance and fewer shutdowns, keep your engines clean with MICHIANA Filters . . . Write for new Bulletin 42-D. MICHIANA PRODUCTS CORPORATION, Michigan City, Indiana.



Pair of 17400 Filters on common bracket, Filter Element, and single 17400 Filter. No. 17400 (50 H.P.), is 15⅝" long; No. 17500 (100 H.P.), 24⅛"; 17600 (150 H.P.), 33⅛". All shell diameters, 7¼".

MICHIANA OIL FILTERS

Bear machines make this new technique available to every manufacturer and maintenance concern requiring Dy-Namic Balancing for either products of their manufacture or for their own production machinery, motors, etc.

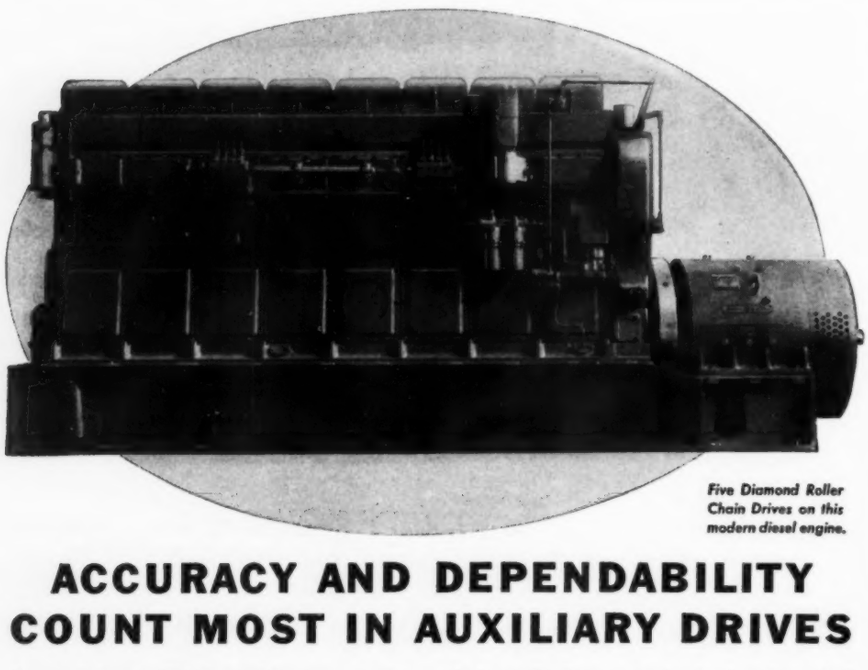
These Bear machines embody a new, extremely sensitive and accurate balancing principle which not only makes possible a low cost machine but, equally important, an easy-to-operate machine. Thus, it is now economically possible to balance practically all rotating parts both from a standpoint of cost of machinery as well as manpower availability.

These Bear Balancing Machines indicate the disturbing centrifugal force or force couple with a high degree of accuracy. Both the angular position and the value or amount of unbalance is shown at the same time. With these balancing machines, it is unnecessary to static balance before a Dy-Namic Balance test can be made. The balancing machine reveals whether a static or Dy-Namic unbalance, or both, are present without reversing ends of the body being balanced.

Bear balancing machines are available in a variety of models ranging from bench models to large floor and pit-type models for balancing such rotating parts as armatures, fans, blowers, fly-wheels, hubs, drums, propellers, gears, impellers, pulleys, wheels, rotors, etc., weighing from 6 ounces to 1000 pounds.

Catalog containing complete line and data relative to the Bear Dy-Namic Balancing Technique is available from The Bear Mfg. Co. and will be sent to interested production and maintenance men, design engineers and other interested executives. Address the Bear Mfg. Co., Industrial Division, Rock Island, Illinois.

This catalog also contains concise data on Dy-Namic Balancing and its importance in eliminating noise and premature wear due to excessive vibrations from couple action.



Five Diamond Roller Chain Drives on this modern diesel engine.

ACCURACY AND DEPENDABILITY COUNT MOST IN AUXILIARY DRIVES

Among the many Diesels used to power marine craft—and equipped with DIAMOND Roller Chain precision auxiliary drives—the new Type EN-8 Cooper-Bessemer direct-reversing engine is a good example.

The experienced builders of these engines with their specialized engineering force have incorporated five DIAMOND Drives—one for each of the sea water, fresh water, fuel oil and lube oil pumps—and one for timing. Naturally the satisfactory operation of these engines depends upon the accuracy and dependability of these drives.

As originators of roller chains DIAMOND has devoted over 52 years to their development and improvement. DIAMOND pioneered roller chain applications on mechanized equipment of every kind—and through the taking on of the responsibilities has gained the respect of engineers in all branches of industry.

DIAMOND Drives are compact and quiet with precision-made symmetrical parts of heat-treated alloy steels that retain the accuracy and meet the exacting requirements of our leading engine builders.

DIAMOND engineers can aid you in more quickly arriving at your drive requirements—for timing, auxiliaries, power take-off, generators, exciters. DIAMOND CHAIN & MFG. CO., 407 Kentucky Avenue, Indianapolis, Indiana. Offices and Distributors in All Principal Cities.

DIAMOND ROLLER CHAINS

New Type Aligning Shaft Coupling

ILLUSTRATED herewith is the Barcus gear coupling for driving and driven shafts.

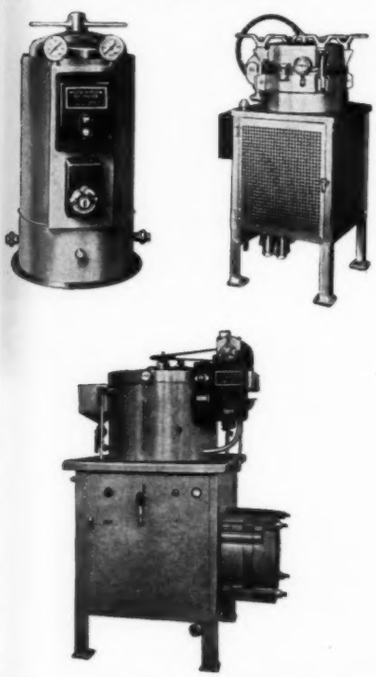
The coupling consists of a cylindrical housing shell with internal gears having stub teeth with a 20° pressure angle and two generated gears with hub extensions to which the driving and driven shafts are connected. The teeth of the spherical gears mesh with the stub teeth in the housing producing a ball action which compensates for misalignment of shafts with resultant reduction of friction and pressure on shaft bearings. Full particulars on this interesting self-aligning coupling are given in a file size bulletin, copy of which will be mailed on request to Barcus Engineering Company, 3951 Falls Road, Baltimore, Maryland.

New Bearing Metal Bulletin

A NEW BULLETIN on bearing metals, which is particularly timely and helpful in view of war-time restrictions on tin-base babbitts, has just been published by Magnolia Metal Company. This bulletin describes various lead-base metals which have been found exceptionally long-wearing on shock loads, on heavy sustained pressures, and on general service and which have proved to be excellent substitutes for tin-base bearing metals. Two useful features of the bulletin are a number of practical suggestions for best results in making and maintaining journal bearings, and a table of recommendations for selecting the correct type of bearing metal for 135 different types of machinery. In addition, the bulletin also describes Isotropic Bronze Bushings, die-cast by the crystal control method which produces a more homogeneous and stronger structure than that of ordinary bronze bearing stock. Copies of this informative bulletin can be obtained by addressing Magnolia Metal Company, 18 West Jersey Street, Elizabeth, New Jersey.

Lube Oil Purifiers, for Oil and Engine Conservation

VARIOUS TYPES of Hilco lubricating oil purifying equipment for Diesel engines are shown in the accompanying illustration.



At upper left is a filter, the Hyflow, for direct-connecting to one or more engines for continuous or intermittent bypass filtering. These units use Fuller's Earth as a filtering medium, and are also readily convertible to the use of cotton waste and other specially prepared filtering materials for use in connection with purifying oils containing additives and inhibitors.

At upper right is the oil reclaimer used for direct-connecting to the lubricating system of one or more Diesel engines for continuous or intermittent bypass purifying or batch purifying. They use Fuller's Earth as a filtering medium, and the filtering process is followed by a step of evaporation of all fuel dilution and water, which might enter lube oil during use.

The Airline oil purifier, shown in the lower view, is a contact type of oil purifier, and Fuller's Earth is used as a filtering medium. These units do a very complete job of oil purifying, and the process also includes the removal of water moisture and fuel dilution. An interesting set of bulletins is available upon request to The Hilliard Corp., Elmira, N. Y.

THE Chief Engineer at Geyser says, "Before we used a PREMAX to check compression and firing pressures of our Diesels we cleaned pistons and rings three times yearly. Now we clean the engines once a year — the PREMAX enables us to determine exactly how long they can be operated efficiently before a clean-up is necessary."

You can get maximum power output . . . lengthen the period between clean-ups . . . protect your engines against sudden breakdown . . . effect substantial maintenance economies . . . and increase fuel efficiency . . . by checking compression and firing pressures at regular intervals with the PREMAX Indicator.

Case studies indicate that the use of this simplified precision-testing instrument assures uninterrupted power — and that it pays for itself many times over through fuel savings alone. Bulletin 283 gives full particulars in clear, understandable language. Send coupon now. No obligation.

CHIEF ENGINEER S. J. MORRIS USES THE PREMAX TO OBTAIN INSIDE INFORMATION AT A GLANCE

The direct-reading PREMAX Engine Pressure Indicator is ideally suited for operating men. It is rugged, fool-proof, dependable — requires no skill, scale measurements, or calculations. Anyone can use it with assurance of getting accurate readings at all engine speeds. The PREMAX is easily attachable to all types of Diesel engines, including the latest automotive models.

MAIL Now

SEND ME PREMAX BULLETIN 283

Name _____

Address _____

City _____ State _____

We Operate _____
Make of Engine

No. Cylinders H.P. R.P.M.

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 BENNETT STREET • PITTSBURGH, PA.

"How To Repair Valves" By Crane Company

THAT is the title of a new bulletin on piping pointers (No. 5 in a series) just issued by Crane Co., Chicago. It explains and illustrates the various steps to take in repairing leaky gate and globe valves, as well as hints on how to reclaim discarded valves.

All valves wear out in service, but this bulletin enables the users of valves to get better and longer service by keeping them in good operating condition. This subject is most timely in these days of maximum industrial production when valves, like other piping materials, are now always easy to obtain.

All maintenance men, operating engineers, pipe fitters, and plant executives should have a copy of this valuable shop bulletin. It will be mailed on request by any Crane branch, or to Crane Co., 836 S. Michigan Ave., Chicago, Illinois.

PAGES FROM A DIESEL ENGINEER'S SCRAPBOOK
(7)
EQUIPMENT: Lube Oil and Jacket Water Coolers
SERVICE: Shipboard
PROBLEMS: 1. Prevention of seawater mixing with lube oil or jacket water on inside of shell
2. Provision for expansion of removable tube bundle
SOLUTION: Packed floating head design containing leak-off gland vented to the atmosphere
RECOMMENDATION: Ross "B C P" Coolers
n
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ronger
vidence
81% of
ica's Diesel
gine builders
Ross Coolers
WRITE FOR YOUR FREE COPY OF BULLETIN 5222
ROSS HEATER & MFG. COMPANY, Inc.
Division of AMERICAN Radiator and "Standard" Sanitary Corporation
GENERAL OFFICES AND PLANT--BUFFALO, N. Y.

Hill Diesel Specification Sheets Available

A COMPLETE set of specification sheets, fi size and punched for loose leaf binders, cover ing full particulars on Hill Diesels, Diesel gen erating sets, and power units, is now available upon request to Hill Diesel Engine Co., A Di vision of Rogers Diesel and Aircraft Corpora tion, 1120 Leggett Ave., New York City, or Lansing, Michigan.

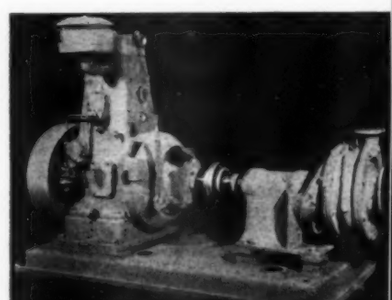
Charles H. Currier Honored

CHARLES H. Currier has been elected a civil member of the American Society of Naval Engineers.

Mr. Currier is Vice President and General Manager of Ross Heater and Mfg. Co., Inc., a division of American Radiator and Standard Sanitary Corp., Buffalo, N. Y.

Allis-Chalmers Pumps Aiding Wartime Industrial Needs

NEW in design and new in construction, Allis Chalmers pumps are providing dependable pumping performance which is proving a real help in enabling industry to meet most exact ing wartime requirements. These compact



sturdily-mounted pump-and-power units are highly popular, not only with industrial users but also with the government for which they are also being manufactured. This model of Allis-Chalmers pump is powered with Witte Diesel engines manufactured by the Witte En gine Works of Kansas City, Missouri, who have joined hands with many pump manufacturers to produce combination pump-and-power units to serve America's war effort.

Army and Navy "E" to Sperry Gyroscope Co., Inc.

ADDRESSING what was probably the larges gathering of employees of a war production organization which has been held during the present war effort, Rear Admiral Clark H

Woodward, USN, and Major General Levin H. Campbell, Jr., U. S. Army, participated in awarding the joint Army-Navy "E" Production award to the Sperry Gyroscope Company at a

mass meeting of its employees, their families and friends, and high officials of the Army and Navy in Madison Square Garden at 3:30 Sunday afternoon, August 16. Governor Herbert H. Lehman was an honor guest at the ceremony and addressed the employees.

Wartime restrictions do not permit giving the exact number of employees present, but company officials and officials of the Garden said that the attendance totaled well over 10,000. The fact that the company employees, all of whom work on a six day week, were willing to give up time on Sunday afternoon to attend such a meeting, was regarded as indicative of their recognition of the importance of the Army-Navy award, and of each employee's pride in the fact that henceforth he or she will be able to wear the Army-Navy "E".

Governor Herbert H. Lehman was introduced by Master of Ceremonies Thomas A. Morgan, Chairman of the Board of Sperry Gyroscope Company. In commenting on the award, Governor Lehman said:

"It is no exaggeration to say that virtually every American Navy vessel carries Sperry instruments. These instruments have become an indispensable aid to the flying of large aircraft and to the navigation of warships. Countless other devices needed in our war effort come from your shops. • • • "

The flag, which is the emblem of the Army-Navy "E" was presented to R. E. Gillmor, President of the Sperry Gyroscope Company, and John Stangl, Assembly Leader, a veteran Sperry employee, by Admiral Woodward, Chief of the Incentive Division, USN.

Mr. Gillmor accepted the award on behalf of the company and pledged the continued dedication of its efforts to increased production for the fighting forces.

Two of the "E" pins, which are worn by the members of organizations receiving the award, were presented by Major General Campbell, Chief of Ordnance, U. S. Army, to Louis Malkovsky, Vice-President for Manufacturing, and to Gustav Kimmich, First Class Inspector, another Sperry veteran.

General Campbell paid tribute to the many years of collaboration between the Sperry Company and the U. S. Army, and especially drew attention to the standards of Sperry craftsmanship in the development and manufacturing of precision instruments used by the armed forces.

SO NIGHT WORKERS MAY SLEEP DAYS

This war worker's flag, displayed outside a home during daytime sleeping hours, silently asks neighbors to be quiet. This idea, promoted by a prominent New England Department Store, is sweeping the country.

HOW INDUSTRY CAN COOPERATE

Industrial plants, power houses, etc., located near residential districts, may easily cooperate in this worthwhile movement by silencing such noises as stationary gas, gasoline and Diesel engine exhausts, the roar of steam blow-offs and compressor intake suction.

Maxim Silencers, pioneer equipment for the suppression of such preventable noises, may be installed on exhaust or intake lines to operate effectively, year after year, with practically no maintenance.

THE MAXIM SILENCER COMPANY
94 Homestead Ave. Hartford, Connecticut

New Oakite Manual Describes Safe De-Scaling Methods Essential to War Time Maintenance

REMOVAL of heat insulating lime-scale and rust deposits from cooling systems of both stationary and automotive high-speed Diesel engines and water-cooled auxiliaries to prevent overheating, scored cylinders, faulty lubrication, and other related costly troubles has long been one of the principal maintenance problems confronted by municipalities, utilities, bus and truck fleet operators, power and metal-working plants and other Diesel operators. But due to the war-time necessity of conserving equipment, increasing operating efficiency and shortening shutdown time for handling required maintenance, de-scaling cooling systems of Diesel engines and accessory equipment at regular, periodic intervals on an effective, safe basis is more important today than ever before.

That is why engineers, superintendents, foremen or other executives responsible for this essential phase of Diesel maintenance seeking the latest, up-to-the-minute data on effective, safe de-scaling and cleaning methods will be interested in the newly revised and enlarged fourth edition of a twenty-four page manual on this subject just issued by Oakite Products, Inc., New York.

The manual concisely reviews modern, economical methods for safely removing lime-scale and rust deposits from Diesel engine cooling systems as well as from "lube" oil and jacket-water coolers, heat exchangers, ammonia condensers, air and gas compressors and many other types of water-cooled or water-circulating equipment.

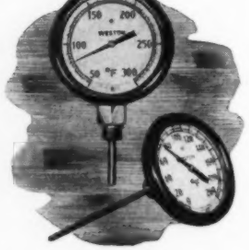
In this connection, the manual also gives considerable data on how a specially developed scale-dissolving material, Oakite Compound No. 32, not only eliminates the hazards to personnel and equipment so frequently involved with the use of commercial raw acids, but also obviates the need for tedious, time-consuming mechanical methods on a wide range of scale and rust removal work.

Copies of this fact-filled, illustrated manual are available upon request. Write to Oakite Products, Inc., 22D Thames Street, New York City.

THE ALL-METAL THERMOMETER

stands shaking up...without breaking down

The reason why the WESTON Thermometer can "take it" is found in its simplified, all-metal construction. There is but one moving element, and even that part is made of enduring metal. There is no gas or liquids . . . no capillary . . . no fragile members. Thus the WESTON not only resists ordinary breakage but it also stands up in applications where vibration is present . . . maintaining its high initial accuracy (within 1% over entire scale) over far longer periods. Available in types, sizes, ranges and stem lengths for Diesel and many industrial applications. Descriptive literature available on request. Weston Electrical Instrument Corporation, 579 Frelinghuysen Avenue, Newark, New Jersey.



WESTON all-metal temperature gauges are available in both angle and straight stem types; scale diameters up to 6"; stem lengths from 2" to 24".

WESTON *All-Metal* TEMPERATURE GAUGES

FOR VICTORY

BUY UNITED STATES WAR BONDS AND STAMPS

Willard Publishes Diesel Battery Replacement Table

THE new 1942 Diesel Engine Catalog, Volume 7, contains a feature of exceptional interest and value to all Diesel owners and operators. It is a full-page replacement table showing batteries for use with both Diesel and gas engine starters on current makes and models of Diesel engines.

It is believed that this is the most complete and authentic table of its kind ever published. It should certainly prove a decided help to the Diesel operator in selecting the proper type and capacity of battery for his specific Diesel cranking job.

Maintenance Hints for Two Cycle Gas Engine Driven Compressors

IN conveniently arranged form, Clark Bros. Co., Inc., Olean, New York, manufacturers of engines and compressors, have just published a booklet entitled, "Maintenance Hints for Clark 'Angle' Super Two Cycle Gas Engine Driven Compressors."

Briefly, it considers:

1. The *proper maintenance* of the Clark unit and *when* it should be done.
2. The *troubles* which operators sometimes encounter and the *methods to solve* them.

Also there is a section comprised of twenty-three Do's and Don'ts which every plant engineer and maintenance man should know in order to reduce maintenance and repair costs.

This timely booklet contains no advertising and is available upon request.

West Coast Diesel News

TO handle emergency power and light load, two automatically controlled Worthington 300 hp. at 350 rpm. Diesel compressor units have been installed in one of Southern California's largest industrial plants—compressor end unloads in emergencies, generator takes over, builds up voltage, and puts unit on line.

TEN Caterpillar D46 marine Diesels have been purchased by the Hodgson Shipbuilders, Long Beach, California, for propulsion of 50-foot shore boats they are building. These 60 hp. engines will drive through Twin Disc gears.

LINDA, 44-foot all Monel metal fastened fishing boat under construction by Charlie Lindwall, boatbuilder, Santa Barbara, California, is powered with a 60 hp. Caterpillar Diesel with 3 to 1 Twin Disc reduction gear.

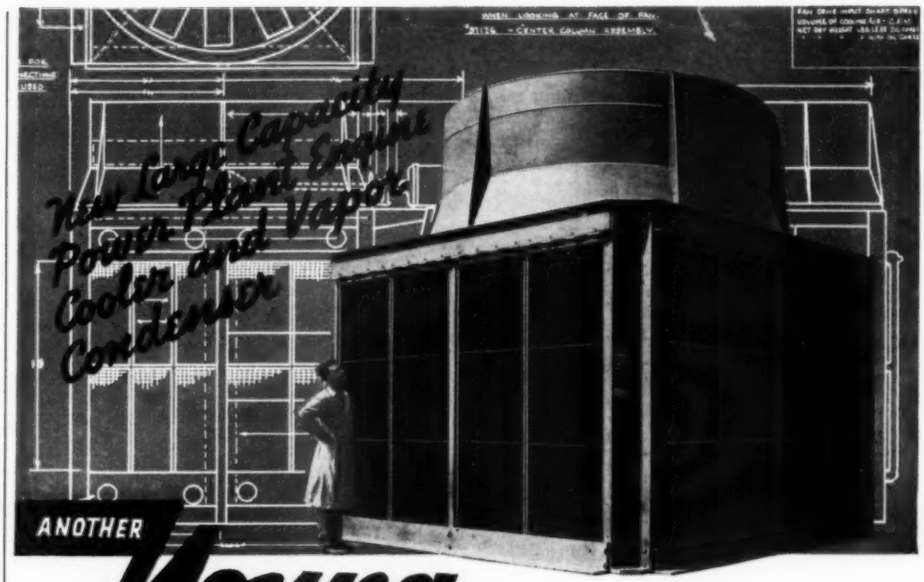
THE 70-foot bait boat *Senorita*, Joaquin Medina and son Carl, San Diego, California, is repowered with a latest type back flow scavenging, full pressure lubricating 35-F Fairbanks-Morse 6 cylinder, 180 hp. marine Diesel.

EQUIPPED with Korfund Vibro Isolators, a 88/50 D.C. generator set—70 hp. Caterpillar Diesel and General Electric generator—has been purchased from the Shepard Tractor and Equipment Co., Los Angeles, California, for installation in an unnamed naval repair vessel.

FOR deep well pumping service, a 60 hp. at 1500 rpm. Caterpillar Diesel with heavy duty Twin Disc clutch has been delivered to Gibbons and Reid, Los Angeles, California, contractors.

THE 70-foot seine boat *W. F. Wood*, Tony Marinkovich, San Pedro, California, is repowered with the new model 35F Fairbanks-Morse back flow scavenging, 200 hp. Diesel.

PUSHING 200,000 gallon gasoline barges against the turbulent current of the Columbia River is the big job of the Tidewater Transportation Company's 65-foot new tug *Viking* powered with an 800 hp. Enterprise Diesel. Diesels on the Columbia are steadily making history.



ANOTHER **Young**

One YOUNG "Quad" has the capacity to cool a 2000-hp. DIESEL engine.

Young ENGINEERING AND MANUFACTURING SERVICE SPECIALIZING IN HEAT TRANSFER PRODUCTS

ENGINEERING ACHIEVEMENT

First of their type ever built, nine YOUNG *Quad Atmospheric* Cooling and Condensing Towers are being installed in Illinois for a large oil company. New in design yet based on time-tried principles, they will be used for the dissipation of heat from engine and compressor jackets, as well as engine lubricating oil, and for condensing processing steam used in the production and distillation of certain petroleum by-products required for the manufacture of aviation gasoline.

These creations of YOUNG engineering and research are unique in the manner in which they dissipate heat loads with a power-propelled atmospheric blast drawn through the cores of multiple radiator units. Such installations as this are typical of YOUNG resources . . . facilities that are yours to call on. YOUNG also manufactures a complete line of Jacket Water Coolers for power plant installations and stationary engines from 40 to 600 HP. Consult with YOUNG engineers about your Heat Transfer problems.

YOUNG RADIATOR COMPANY
Dept. 232-K, Racine, Wis., U. S. A.

DISTRIBUTORS
Midcontinent: The Happy Company, Tulsa, Oklahoma
Pacific Coast: A. R. Flournoy, Bell, California

OTHER YOUNG PRODUCTS

Among the more than 100 YOUNG heat transfer products are marine and industrial type heat exchangers; automotive type radiators; aircraft oil temperature regulators, supercharger intercoolers and cabin heaters; evaporative coolers; and a complete line of heating, cooling and air conditioning units.

★ *BUY U. S. WAR BONDS—SALVAGE SCRAP* ★

Young HEAT TRANSFER PRODUCTS
OIL COOLERS · GAS, GASOLINE, DIESEL ENGINE COOLING RADIATORS · INTERCOOLERS · HEAT EXCHANGERS · ENGINE JACKET WATER COOLERS · UNIT HEATERS · CONVECTORS · CONDENSORS · EVAPORATORS · AIR CONDITIONING UNITS · HEATING COILS · COOLING COILS

Young ENGINEERING AND MANUFACTURING SERVICE SPECIALIZING IN HEAT TRANSFER PRODUCTS

SUCCESSFUL OIL PURIFICATION
is guaranteed by Honan-Crane Oil Purification Equipment plus over 20 years experience of Honan-Crane in solving problems of dirty and contaminated oil.
Honan-Crane "Continuous" Oil Purifiers are—
Direct Connected and "Continuous"
Automatic—Economical to operate
Streamlined—Completely insulated
Honan Crane
600 Indianapolis Ave.
LEBANON, INDIANA
OIL PURIFICATION EQUIPMENT

WEAK HEARTS DON'T WIN RACES
HALL Diesel Type ECCENTRIC Valve Seat Grinder.
HALL Model 80-A WET TYPE Valve Refacer.
Valves are the HEART of most Diesel engines.
Today, in the race against waste, weak-hearted motors don't win.
To achieve maximum economy and performance—with longer periods between needed valve overhauls, you need HALL-ECCENTRIC Valve and Valve Seat servicing equipment.
There are a lot of technical "reasons why" that a request to the factory will bring by return mail. Write for them today.
THE HALL MANUFACTURING CO.
TOLEDO, OHIO
HALL

A PARTICULAR outstanding Caterpilla Diesel delivery went to Griffin Co., Los Angele consisting of sixteen D468 automotive units, cylinder, 468 cu. in, 98 hp. at 1800 rpm. for u in Mack dump trucks.

TO repower a Northwest lumber yarder, th Inyo Lumber Co., Inyokern, California, has pur chased a D4400 Caterpillar Diesel equippe with a special type of herringbone reductio gear.

FOR the U. S. Army Engineers, Colberg Bros of Stockton, California, have completed a 9 foot survey boat for use on the two rivers. Sh has a supercharged Cummins Diesel of 200 hp Twin Disc clutch, Monel metal shaft and Good rich cutless rubber stern bearings.

THE program of the Army's boat constructio plan is steadily increasing on the Pacific Coas and among the larger type of vessels now unde construction are several 127-foot twin screw 600 hp. Fairbanks-Morse Diesel engined heav duty towboats.

TWIN Cummins 150 hp. Diesels propel th new Mirene Company's 42-foot tug recentl completed by Werner Albertson, boatbuilde Portland, Oregon. Of 42 feet, the tug is i service on the Columbia and Willamette River handling barges and log rafts.

THE well known 68-foot *Santa Cruz*, Ed. Stan ton's service boat between Santa Barbara, Cali fornia and the huge ranch on Santa Cruz Island off the California shore, is now repowered with a new Caterpillar Diesel swinging a 40 in. b 40 in. wheel.

THE date ranches in the Cochella Valley, in land Southern California where the tempera ture nicks 115 and thinks nothing of it, need lots of water. Hunter Palms Ranch at Indio has installed a Caterpillar D3400 with Twin Disc clutch operating a Peerless vertical cen trifugal deep well pump for irrigation.

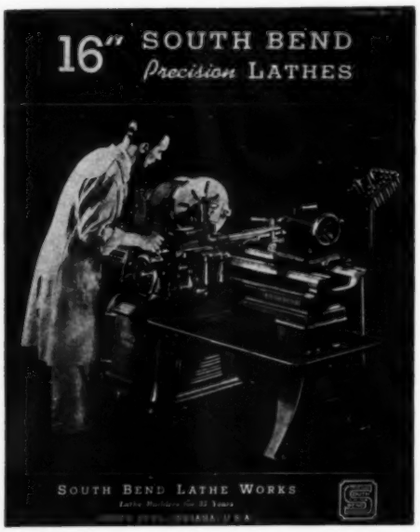
THE Harbor Boat Works, Vancouver, B. C. have delivered to Pacific Mills, Ltd., a new 9 ft. 6 in., towboat powered with a 100 hp. Cater pillar marine Diesel with 2 to 1 Twin Disc re duction and reverse gears swinging a 44-inch propeller.

TEN Cummins Diesel-Westinghouse 50 kw. direct connected generating sets have been de livered to Contract Ship Constructors at Na tional City, California, for installation in pairs in the new 375-foot concrete barges now under construction for oil service.

THE Case Construction Co., San Pedro, Cal., have repowered their tug *Crossmore* with a new 180 hp. Fairbanks-Morse Diesel replacing one of 15 years' service.

New Catalog of South Bend 16" Precision Lathes

CATALOG No. 16, describing South Bend 16" precision lathes, has just been issued by the manufacturer.



This eight-page, file-size catalog completely illustrates and describes South Bend 16" toolroom lathes and 16" quick change gear lathes. Attachments, accessories, and tools for use with these lathes are also listed.

Construction features of the lathes are illustrated. Specifications are tabulated for ready reference. These lathes have 16¼" swing, 1" collet capacity, and are made in several bed lengths providing between-centers capacities from 33½" to 105½".

For copy of Catalog No. 16 write to South Bend Lathe Works, Dept. D2, South Bend, Indiana.

Missouri University To Have Navy Diesel Training School

MR. Clyde W. Bailey, president of The Bailey Diesel School, St. Louis, Missouri, has recently been appointed by the United States Navy to assist in the organization of the Class A Navy Diesel School at Missouri University, Columbia, Missouri. Mr. Bailey is further honored by the fact that forty-five Bailey Diesel graduates have been chosen as instructors for this school.

Bailey trained men are now holding important jobs in all branches of the service and filling

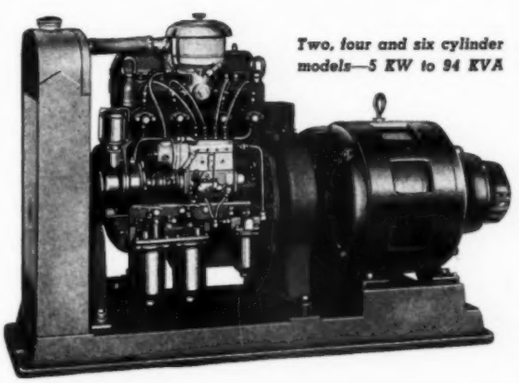
1st IN DESIGN
TOPS IN EFFICIENCY

☆ Quincy was the first to design an air compressor that combined modern appearance with improved mechanical features. Construction is simpler. Radiation area is increased 12%. Lubrication is more thorough—more positive. Quincy builds air compressors *exclusively*. This policy of specialization has made Quincy a symbol for dependability. Quincy Compressors provide air for Diesel starting and other services requiring intermittent pressures up to 500 lbs. per sq. inch. *If you have compressed air problems in your work, let us help you solve them!*

Quincy COMPRESSORS

QUINCY COMPRESSOR CO., DEPT. 4102, QUINCY, ILLINOIS

U. S. DEPENDABILITY

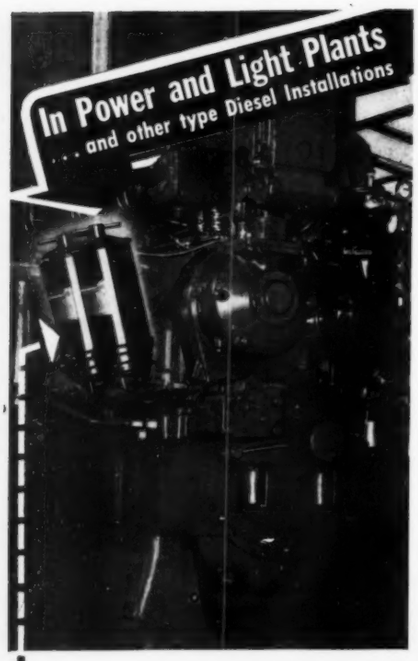


Two, four and six cylinder models—5 KW to 94 KVA

U. S. DEPENDABILITY, in peacetime, means user satisfaction, convenience, low cost service. Today U. S. DEPENDABILITY means life or death . . . . battles won or lost. *Electricity is the nerve center of modern warfare.*

U. S. MOTORS CORP.
OSHKOSH, WISCONSIN

U.S. DIESEL
ELECTRIC PLANTS



DeLuxe *CLEANSED OIL*

HELPS ASSURE CONTINUOUS TROUBLE-FREE OPERATION

DeLuxe oil cleansing is important to all diesel installations, but especially important in power and light plants where smooth, uninterrupted operation and freedom from shutdowns are essential. Because DeLuxe oil cleansing provides an important insurance against engine shutdowns. It is the only filter that *prevents* trouble-making oil contamination by *cleansing* oil of asphaltenes *before* they can unite with other substances to form "saboteuring" sludge and engine varnish.

ONLY DELUXE HAS ALL EIGHT CONSTRUCTION FEATURES

essential to continuous, complete oil cleansing! With DeLuxe any fortified oil can be used without fear of altering its chemical balance, because DeLuxe's exclusive cleansing action is not dependent on a chemical agent. Write for "Filter Facts" booklet today. DeLuxe Products Corp., 1416 Lake St., LaPorte, Ind. *In Canada:* 364 Richmond St. W., Toronto, Ontario.

DELUXE
OIL FILTER
DOES MORE THAN STRAIN OIL
... MORE THAN FILTER OIL
Actually Cleanses Oil!

the need for skilled Diesel mechanics in vital war industries.

The high efficiency of Diesel engines and the ability of capable Diesel men to "keep 'em rolling" is playing an all important role in today's struggle for freedom and The Bailey Diesel School is proud of the opportunity to do its part.

Lambert Starting 20th Year With Quincy Compressor

D. C. LAMBERT, manager of the Chicago branch of Quincy Compressor Co., started his twentieth year of service with the company on July 9. Mr. Lambert first accepted a position with Quincy in 1922 as a member of the main office staff. In 1929 he took over the management of Quincy's Chicago office, in which capacity he still is active.

D. C. Lambert

In addition to his work with Quincy, Mr. Lambert has been active in outside functions. He is a member of the Board of Directors of the Chicago Executives' Club.

Plant Expansion Project At Sealed Power Corporation

SEALED Power Corporation, Muskegon, Michigan, continues expansion with construction now under way on a new $1,950,000 project under Government contract for the production of aviation piston rings.

A large addition to the present plant was recently completed and is now in production on aircraft rings.

Additional equipment recently made available through a plant facilities' contract from the Navy provides for substantial expansion in piston and cylinder sleeve production.

TO DESIGNERS
and users of
DIESEL ENGINES
and diesel-powered equipment

"ASK BLACKMER ABOUT PUMPS"

THE PUMP THAT IS SELF-ADJUSTING FOR WEAR
FAMOUS BUCKET DESIGN

The "Bucket Design" (swinging vane) principle offers many advantages—
Utmost Dependability
High Efficiency
Rugged Design
Hydraulic Balance
Compact Size
Positive Displacement
No Maintenance Worries
These features have proved valuable in hundreds of diesel installations—stationary, locomotive and marine.

THERE IS THE RIGHT BLACKMER PUMP FOR MOST DIESEL APPLICATIONS.

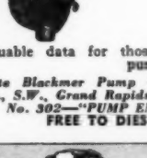
DIRECT-CONNECTED PUMPS

5-10-20 GPM
100 psi
All standard drives.

REDUCTION GEARED PUMPS

5 to 700 GPM
300 psi.
All standard drives.

ROTARY HAND PUMPS



7 to 25 GPM
54 Models.

Valuable data for those who buy and service pumps.

Write Blackmer Pump Company, 1961G Century Ave., S.W., Grand Rapids, Michigan for BULLETIN No. 302—"PUMP ENGINEERING DATA."
FREE TO DIESEL OPERATORS

War Needs Come First

WITTE DIESELECTRIC PLANTS

Today, these famous WITTE Dieselectric Plants are aiding the war effort by supplying dependable low cost auxiliary power for industry everywhere. Right now, America's victory needs come first. *PROMPT SHIPMENT GIVEN TO HIGH PRIORITY ORDERS.* After victory, improved WITTE Dieselectric Plants will again be ready to serve everyone.

A WITTE Diesel is worth waiting for . . .

2447 Oakland Ave. Kansas City, Mo.

WITTE ENGINE WORKS

• LARGEST BUILDER OF SMALL DIESELS •

DIESEL ENG. GEN. SET FOR SALE

6 cyl. 14 x 17 F.M. 257 RPM. VA, Solid injection d/c to 300 KVA, 3/60/2300 gen. with d/c exciter complete with auxiliaries—excellent condition—can be seen in operation—Price $12,000.

ILLINGWORTH ENGINEERING CO., Jacksonville, Fla.

WOODWARD GOVERNOR CO.

WORLD'S LARGEST AND EXCLUSIVE MANUFACTURERS OF HYDRAULIC GOVERNORS FOR PRIME MOVERS

ROCKFORD • ILLINOIS

PETROMETER

FOR TANK GAUGING EQUIPMENT FOR DAY TANKS & CLEAN OIL STORAGE

PETROMETER CORPORATION

8 STAR SQUARE. LONG ISLAND CITY. N. Y.

Ice Cream Cabinets, $10 up; compressors, $5 up; ¼-h.p. motors; 30-h.p. slipring 8x8 and 9x9 ammonia compressors, 2 Krupp diesels, 90 h.p., 3 cylinders; Kelvinator 1 and 2 hole ice cream cabinets; 4x4 York self-contained ammonia plant. 574 West 130th St., New York,

When completed, these increased facilities will require the employment of an additional 2000 people.

A New Edition of the Standard Booklet on Machining Alcoa Aluminum Is Announced

THIS BOOKLET sets forth the general principles of machining aluminum and its alloys; suggests speeds, feeds, and depths of cut which will produce satisfactory results; points out where practices and tools common to other metals may be used; and indicates where special practices or tools are desirable. Part 1 deals with general machine shop practice. Part 2 describes the practices employed in automatic screw machine operations.

Copies of the booklet may be secured, free of charge, by writing to Aluminum Company of America, Pittsburgh, Pennsylvania.

A Valuable Contribution to the Subject of Diesel Maintenance

THE October issue of "Sinclair Firebox" is entitled "Diesels at War" and carries an extensive study of Protective Maintenance. Presented in easy-to-read style, the subject matter of this issue is developed around "The Flow of the Four Fluids"—a unique, although obvious, approach. Read the thesis:

" 'Fluid' = 'A liquid or gaseous substance capable of flowing.' In the operation of a Diesel Engine, four fluids are involved: AIR, FUEL, LUBRICANT, WATER.

"These four fluids flow through the engine, each along a very definite path, each accomplishing a very specific purpose. Every vital part of the Diesel engine is connected with the flow of at least one of these four fluids: the injection system, the combustion chamber, the exhaust, the cooling passages, the lubricating ports and channels, etc., etc.

"As long as the flow of these four fluids takes place as intended by the designer of the engine, as long as the quality and the quantity of these fluids are correct and their passage unimpeded, the operation will be satisfactory and efficient, and the mechanical parts will be protected against wear and tear. But let there be any irregularity, any hindrance to the proper flow of either one of these four fluids, and immediately some unpleasantness is liable to occur.

"These unpleasant consequences of a failure in the Flow of one of the Four Fluids can be listed somewhat as follows: Loss of Power, Smoke, Noises (Combustion knock, Mechanical Noises & Vibration).

"It is, therefore, entirely possible to follow carefully each of the four fluids mentioned, in their flow throughout the Diesel, point out the precautions that must be taken to avoid any failure of the correct flowing process, and, as a consequence, maintain the Diesel Engine at the peak of its efficiency and longevity. . . ."

And then it goes on to the treatment of the flow of each fluid in the order named—following each section with recommendations for proper care of Diesels with respect to each fluid system. This absorbing issue of the "Sinclair Firebox" will be reprinted in an early issue of DIESEL PROGRESS but meantime Diesel Engineers and Operators may secure a copy by writing Sinclair Refining Company, 2540 West Armak Road, Chicago, Illinois.

PRECISION BUILT

DEMCO

FUEL INJECTION EQUIPMENT

Demco design, manufacture and test are based on the ultra-precise requirements of effective Diesel fuel injection. Demco fuel injection units are characterized by compactness and clean, simple design, highest quality materials, superb workmanship.

Demco Fuel Nozzle

Nozzles are made in three sizes, with flat seated needles of standard or non corrosive materials. No. 4 nozzle is self-cooling.

Demco Fuel Injector

Fuel injectors are hydraulically operated, differential, closed type and are made in various lengths with three standard shank diameters.

Demco Fuel Injection Pumps

"PH" fuel injection pumps are port controlled type; they are adaptable to a wide range of Diesels with minor adjustment of timing.

Send specifications with inquiries

DIESEL ENGINEERING & MANUFACTURING COMPANY

200-214 N. LAFLIN ST., CHICAGO, ILLINOIS

Adeco NOZZLE TESTER FOR DIESEL ENGINES

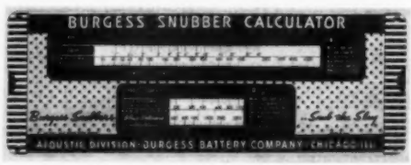
STOP THAT SMOKE! Test your diesel nozzles quickly, accurately — with America's most widely used nozzle tester. This sturdy, light-weight, precision-built, low-cost, portable hand test pump can help you avoid costly delays and possible damage to injector tips.

● Write for illustrated bulletin.

AIRCRAFT AND DIESEL EQUIPMENT CORPORATION
4401 N. RAVENSWOOD AVE., CHICAGO, ILLINOIS
Manufacturers of Diesel Pumps, Injectors, Nozzles, Nozzle Holders, etc.

Burgess Offers Time Saver Snubber Calculator

AS a contribution to the conservation of engineer's time, Burgess Battery Company, Acoustic Division, has worked out an ingenious slide rule calculator for determining within reasonable limits the proper snubber for a given set of requirements. In presenting this calculator



to the field, Burgess points out that it is primarily intended to assist engineers on problems of exhaust silencing requiring immediate attention but it is not intended to supplant the personal services of Burgess engineers who will be available as usual. A limited supply of the calculators is available and you may secure yours by writing direct to Burgess Battery Company, 2815 West Roscoe Street, Chicago, Illinois.

MANZEL FORCE FEED LUBRICATORS for MOST EFFICIENT DIESEL ENGINE LUBRICATION

Manzel DEPENDABILITY eliminates engine shut-downs due to faulty lubrication.
Manzel EFFICIENCY and ECONOMY insure maximum horsepower hours per gallon of lube oil consumed.
Manzel Lubricators start, stop, speed up and slow down with the engine.
Manzel Lubricators deliver ACCURATELY METERED amounts of oil against any pressure usually found in Diesel engines.
Write for Catalog 94-B

MANZEL BROTHERS CO.
275-277 Babcock St. Buffalo, N. Y.

SPRING-MOUNTINGS for VIBRATION-ISOLATION
NOISE-SILENCING-HOODS for REDUCING MACHINERY-NOISES
SHOCK-ABSORBER-MOUNTINGS for SHOCK-ABSORPTION AND MACHINERY-PROTECTION
CARL HUSSMAN—ENGINEERS
3001-07 N. OAKLEY BLVD.
CHICAGO, ILLINOIS

Ready To Go To WORK INSTANTLY!

There is always a new set of Load Cushions in

L-R FLEXIBLE COUPLINGS

FOR DIESELS

No shutdowns. No time lost. Cushions easily interchanged without tearing down coupling. Time and money savers! 1⅛" to 16¾" bores for 1.5 to 25000 H.P. at 100 R.P.M. CORRECTS ALL MISALIGNMENT. Especially designed for Diesels. No lubrication.

Send For Catalog & Selector Charts
For L-R Couplings for every job. Easy to find just the right coupling with these simple charts.

Lovejoy Flexible Coupling Co.
4930 West Lake St., Chicago, Ill.

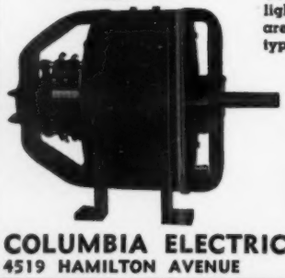
FOR VICTORY

BUY UNITED STATES WAR BONDS AND STAMPS

FUEL INJECTION EQUIPMENT
for Installation by
DIESEL ENGINE BUILDERS
•
EX-CELL-O CORPORATION
Diesel Division Detroit Michigan

XLO
EX-CELL-O means PRECISION

COLUMBIA

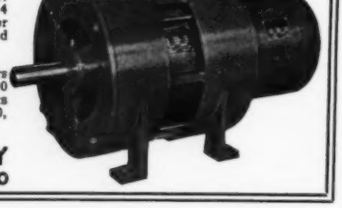


A. C. AND D. C. GENERATORS

Columbia A.C. and D.C. Generators are designed and widely used for light and power service and are ideal for use as ship auxiliaries. They are light in weight, compact and can be furnished in single bearing type for direct connection to engines.

A.C. Generator sizes range from 6¼ to 300 KVA. Speeds: 1800, 1200, 900, 720, 600, 514 and 450 R.P.M. Single or three phase; direct connected or belted exciters.

Columbia D.C. Generators range in size from 7½ to 200 KW, 36, 60, 125 and 250 volts and in speeds of 1750, 1450, 1150 and 850 R.P.M.



COLUMBIA ELECTRIC MFG. COMPANY
4519 HAMILTON AVENUE CLEVELAND, OHIO

CRACKED HEADS WELDED
• ENGINES REPAIRED
VALVE SEATS HARD SURFACED
Satisfaction Guaranteed
BRODIE
AN ENGINEERING SERVICE
117 Clifton Pl. Brooklyn, New York

Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

Inquiries and Patent Work Solicited.
Conducted by C. CALVERT HINES*

2,266,021
DIESEL FUEL

Richard S. George, State College, Pa., and George S. Crandall, Edwin M. Nygaard, and Darwin E. Badertscher, Woodbury, N. J., assignor to Socony-Vacuum Oil Company, Incorporated, New York, N. Y., a corporation of New York.

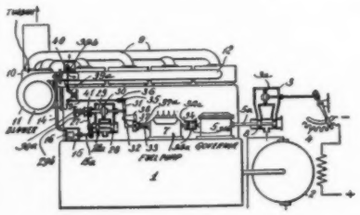
No Drawing. Application June 4, 1940, Serial No. 338,738
14 Claims. (Cl. 44—9)

1. An improved Diesel fuel having in admixture therewith a minor proportion, sufficient to decrease the ignition delay period, of a compound having the general formula R.CX.SNO in which R represents a radical selected from the group consisting of alkyl, alkaryl, aryl, and aralkyl radicals and X is selected from the group consisting of oxygen and sulfur.

2,281,987
INTERNAL COMBUSTION ENGINE AND CONTROL APPARATUS

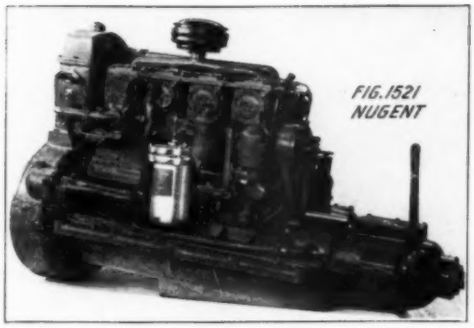
Hans Oswald, Winterthur, Switzerland, assignor to Sulzer Freres, Societe Anonyme, Winterthur, Switzerland.

Application October 28, 1937, Serial No. 171,416
In Switzerland November 7, 1936
8 Claims. (Cl. 60—13)



1. The combination with an internal combustion engine which comprises a turbine driven by the exhaust gases from the engine, a blower driven by the turbine for charging air into the engine, a regulating device operatively connected to the blower responsive to the charging air pressure, a fuel-supply means for the engine, a speed governor driven by the engine, a variable load driven by the engine, a servomotor for varying the load, means operatively connecting the governor to the servomotor and to the fuel-supply means for simultaneously increasing the fuel and decreasing the load as the speed of the engine decreases and simultaneously decreasing the fuel and increasing the load as the speed of the engine increases, whereby the speed of the engine and its output are maintained constant, and means operatively connecting the regulating device to the servomotor for adjusting the opening and closing positions of the servomotor so that for every charging air pressure there corresponds a definite load of the engine maintained constant by the servomotor.

* Patent Attorney, 811 E. Street, N.W., Washington, D. C.



PALMER BROTHERS
Test Boat "BLACK HAWK" LOGS 10,000 Miles with

NUGENT-Equipped PALMER DIESELS

HERE is the report from Palmer Bros. Engine Co., covering a season's operation of two Palmer Diesels that are equipped with Nugent Absorbent Lubricating Oil Filters:

"The 'BLACKHAWK' (Company's Test Boat) logged over 10,000 miles last season, using the Nugent Oil Filter on both engines. Mr. Bolling, our test engineer, reports that he had excellent performance with the filters and was well pleased with them."

This is a typical report from a satisfied user. If you want to protect marine engines against dirt trouble, *use Nugent Filters!* Write for details.

• Fig. 1521 shows a Palmer Diesel equipped with a Nugent Absorbent Lubricating Oil Filter of the type shown in Fig. 1280A. Below is a view of the Test Boat "BLACKHAWK."

Wm. W. Nugent & Co., Inc. Mfrs.
Oil Filters, Oiling and Filtering Systems, Telescopic Oilers, Oiling Devices
Sight Feed Valves, Flow Indicators, Compression Union Fittings, Oil Pumps, Etc.
415 N. HERMITAGE AVE. Established 1897 CHICAGO, U.S.A.

Highest Quality Gaskets & Oil Seals
by **FITZGERALD**
Gasket Craftsmen for 36 Years
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Gaskets of all types and materials to give reliable service under all Diesel operating conditions.
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SINCE 1906
THE COMPLETE LINE THAT COMPLETELY SATISFIES

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The Modern "Oil Conditioner"
Added to
DIESEL FUEL OIL
GIVES MORE POWER
SMOOTHER OPERATION
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CHEMICALLY PURIFIES DIESEL FUEL OIL AND AIDS COMBUSTION
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PRESERVES EQUIPMENT
CONSERVES FUEL OIL
on land, sea and in the air

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Naylor
EXHAUST AND INTAKE PIPE GIVES YOU THESE Plus ADVANTAGES

- LIGHT IN WEIGHT
- LEAK-TIGHT
- SAVES STEEL
- ABSORBS VIBRATION
- EASY TO INSTALL
- SAVES MONEY

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DIESEL ENGINE DIVISION
AUBURN • NEW YORK

Milwaukee Vacuum Oil Refiner
For Marine and Stationary Diesel Installations
Holcomb Engineering Company
77-35 113th Street
Forest Hills • New York

2,240,145

MOTOR FUEL COMPOSITION

Franz Rudolf Moser, Amsterdam, Netherlands, assignor to Shell Development Company, San Francisco, Calif., a corporation of Delaware. No Drawing. Application August 22, 1939, Serial No. 291,361. In the Netherlands December 2, 1938

6 Claims. (Cl. 44—9)

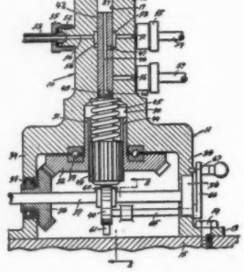
1. A liquid fuel for compression ignition engines containing a small amount of heteropolymeric ketone peroxides obtained by oxidizing a mixture of at least 2 ketones of different molecular sizes one of which is acetone, said mixture having an average number of carbon atoms of not more than 8, the highest number of carbon atoms of any one ketone in said mixture being not more than 12, and the mixtures containing not more than 80 mol % of any more ketone.

2,286,928

DIESEL FUEL INJECTOR PUMP

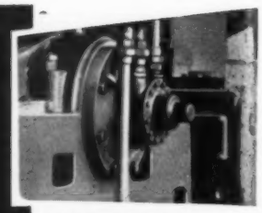
William Louis Pipkin, Jr., Chicago, Ill. Application May 12, 1939, Serial No. 273,258

4 Claims. (Cl. 103—2)



1. In a fuel pump for engines comprising a reciprocatory and rotatable plunger, cam and gear means simultaneously operative to respectively reciprocate and rotate said plunger, said cam being arranged beneath said plunger and in engagement with the adjacent end thereof, and stroke adjusting means for regulating the amount of fuel pumped comprising a wedge adapted to be moved between said cam and plunger end for raising the stroke of said plunger, a rod fixed to the base of said wedge, a movable support, said rod being mounted on one end of said support for vertical movement relative thereto, a coil spring surrounding said rod seated between said support and the base of said wedge, manually operated means connected with said support for moving the same including means for locking said support in adjusted position whereby to hold said wedge in proper position for a selected engine speed.

STRIPPED FOR ACTION



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AMERICAN BOSCH CORPORATION
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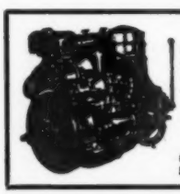

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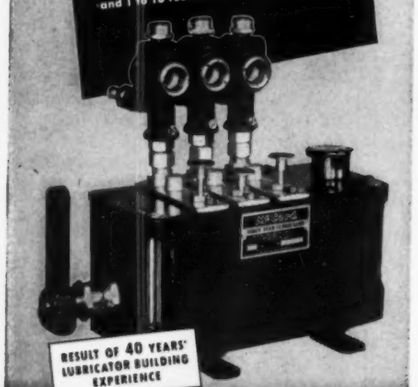

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Power output materially increased by installation of "R-C" Scavenging Blower on Diesel in large Western ice plant.

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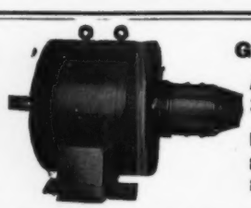
Supercharging and Scavenging BLOWERS



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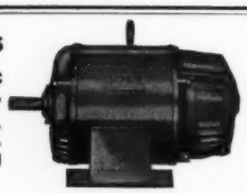
For all applications Stationary and Marine



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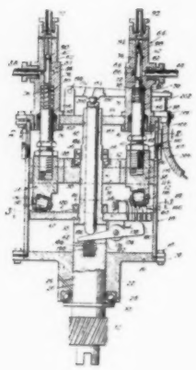
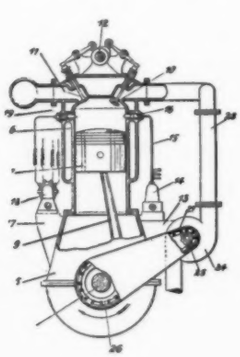
2,283,242
INJECTION FUEL SYSTEM
Petrus J. van der Walt, Memel, Orange Free State, Union of South Africa.
Application July 25, 1939, Serial No. 286,481
5 Claims. (Cl. 123—139)



1. An injection fuel pump for internal combustion engines, comprising a support, a drive shaft mounted in the support, a race fixed to said shaft, downwardly spring pressed plungers for injecting fuel into a cylinder of the engine, a cam carried by the race and having an angular plunger engaging face, means for adjusting said cams so that the entire angular face at all times remains above the race, and a second angular face carried by the cam to allow the plungers to return to the race.

2,280,839
INTERNAL COMBUSTION ENGINE
Fritz Nallinger, Stuttgart, Germany, assignor to Daimler-Benz Aktiengesellschaft, Untertürkheim-Stuttgart, Germany, a company of Germany.
Application January 28, 1938, Serial No. 187,394
In Germany January 30, 1937
4 Claims. (Cl. 123—32)



2. In an internal combustion engine, in combination, a cylinder, a piston in said cylinder, inlet and exhaust passages in said cylinder, means for opening and closing said exhaust passage, means for supplying compressed air to said cylinder through said inlet passage before closure of said exhaust passage and the top dead-center position of said piston, the overlap between the supplying of compressed air to the cylinder and the closure of the exhaust passage covering a range of 40° to 140° of crank angle, thereby expelling any residual gases before the down stroke of the piston, means for injecting fuel into said cylinder substantially at the moment of closure of said exhaust passage, means for closing said inlet passage, and means for igniting the fuel in said